INDUSTRI–PLEX SITE

REMEDIAL TRUST

WOBURN, MASSACHUSET

100% DESIGN REPORT PART I

INDUSTRI-PLEX SITE WOBURN, MASSACHUSETTS

Volume 1 of 8

Prepared by:

Golder Associates
Mt. Laurel, New Jersey

In Association with:

Jordan, Jones and Goulding
Normandeau Associates
Sasaki Associates
Husch & Eppenberger
Environmental Systems
Group Monsanto

SRT-DESIGN-11
903-6400

APRIL 19

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Golder Associates

100% DESIGN REPORT
PART I

INDUSTRI-PLEX SITE
WOBURN, MASSACHUSETTS

VOLUME 1 OF 8

ISRT-DESIGN-11

Prepared for:

Industri-Plex Site Remedial Trust
36 Commerce Way
Woburn, Massachusetts

Prepared by:

GOLDER ASSOCIATES INC.

In Association with:

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April 1992 Project No.: 903-6400

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May 20, 1992 Project No.: 903-6400

United States Environmental Protection Agency
HRS-CAN3, JFK Federal Bldg.
90 Canal Street
Boston, MA 02203-2211

Attn: Mr. Joseph N. DeCola
Remedial Project Manager

RE: INDUSTRI-PLEX SITE, WOBURN, MASSACHUSETTS
100% DESIGN REPORT - PART I

Gentlemen:

On behalf of the Industri-Plex Site Remedial Trust (ISRT) we are pleased to submit three copies of the revised 100% Design Report Part I, Industri-Plex Site, Woburn, Massachusetts" dated April 1992. We are also sending, under separate covers, one copy of this document to Jay Naparstek of Massachusetts Department of Environmental Protection and two copies to Arnie Ostrofsky of NUS Corporation.

This submission incorporates all of the changes made in response to Agency comments on the December 1991 version of the report, as detailed in ISRT's letter dated April 3, 1992. This document supercedes the 100% Design Report, Part I dated December 1991.

Very truly yours,

GOLDER ASSOCIATES INC.

P. Stephen Finn, C.Eng.
Project Manager

PSF/bjt
C:100%CL

100% DESIGN REPORT
PART I

INDUSTRI-PLEX SITE

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CHAPTER 1

INTRODUCTION

CHAPTER 1
INTRODUCTION

On April 24, 1989, a Consent Decree was entered into between the United States Environmental Protection Agency (USEPA), the Massachusetts Department of Environmental Protection (MDEP) and a number of Settlers. The Consent Decree (USEPA, 1989) defines the remediation requirements for the Industri-Plex Site (the Site), located in Woburn, Massachusetts, and is based upon the Record of Decision (ROD) for the Site (USEPA, 1986). The Consent Decree also required that the Industri-Plex Site Remedial Trust (ISRT) be established to implement the remedial work.

In partial satisfaction of the Consent Decree, a Remedial Design Work Plan (RDWP) was developed by Golder Associates Inc. (Golder, 1990a) and approved by USEPA and MDEP (the Agencies). The RDWP defines all work that is to be undertaken to develop designs and specifications for implementation of the remedies at the Site. The RDWP also defines the content of a series of reports to be submitted to the Agencies during development of the design.

On October 1, 1990, the Preliminary (30%) Design Report was submitted to the Agencies (Golder, 1990b). Subsequently, two reports were issued to the Agencies that supplemented the October 1 report (Golder, 1991a and 1991b).

On April 15, 1991, the Intermediate (60%) Design Report was submitted to the Agencies (Golder Associates, 1991c). The Agencies provided comments on the report covering a portion of its contents. Responses to these comments were submitted to the Agencies on July 15, 1991 (Golder, 1991d).

On August 12, 1991, the Pre-Final (95%) Design Report was submitted to the Agencies (Golder, 1991e). The Agencies provided comments on the report, and responses to the Agency comments were submitted on November 1, 1991 (Golder, 1991f).

A Final (100%) Design Report, Part I (Golder, 1991a) was submitted to the Agencies on December 21, 1991 in partial fulfillment of the 100% completion deliverable for the Remedial Design of the Industri-Plex Site.

The Agencies provided comments on the report and responses to the comments were submitted on April 3, 1992 (ISRT, 1992). This revised Final (100%) Design Report (Part I) incorporates the agreed design changes in response to the Agency comments.

Certain portions of the Final (100%) Design Report have been deferred, consistent with instructions from the Agencies (USEPA, 1991a, 1991b), as outlined below:

1. Groundwater Remedy: The Agencies requested that an aquifer test be performed on the Site and that the groundwater extraction system be redesigned, integrating the data gathered from the test. The Agencies also agreed to a deferral of the completion of the groundwater treatment system design while further treatability tests are completed. As a result, Chapters 7 (Groundwater Extraction System) and Chapter 8 (Groundwater Treatment System) are not submitted in this report. Additionally, groundwater extraction and treatment portions of Chapter 4 (ARARs) and Chapter 19 (O&M) are not submitted in this report.

   In the 60% Design Report, Volumes 6 and 7 presented the specifications and drawings related to the groundwater remedy. These documents will be superceded when the groundwater remedy design is completed and are not included in this submission. Final Design of the groundwater recharge system is complete and is included as Chapter 9 of this report. The Final (100%) Design for the Groundwater Remedy will be presented in Part II of the Final (100%) Design Report to be submitted at a later date.

2. Institutional Controls: The Agencies have placed Institutional Controls on a separate schedule from the remainder of the Remedial Design. Therefore, they will be addressed in a subsequent Remedial Design submission.

With the exception of the above elements, this report provides a comprehensive submission of the Remedial Design and, as such, supercedes the previous Preliminary (30%), Intermediate (60%), and Pre-Final (95%) Design Reports, the Final (100%) Design Report dated December 1991, and associated comment response documents (Golder 1990b, 1991a, 1991b, 1991c, 1991d, 1991e, 1991f, 1991g, and ISRT, 1992).

This report is organized in eight volumes, as described below. The chapter numbering follows that of the 60% and 95% Design Reports, including elements of the design which have been deferred by agreement with the Agencies.

Volume 1: Volume 1 presents background materials, a discussion of design compliance with ARARs, and a generalized description of the Site history and investigations, the Site Geology and Hydrogeology, and the groundwater recharge basin design, as follows:

Chapter 1 - Introduction

Chapter 2 - Consent Decree Requirements

Chapter 3 - Remedial Design Work Plan Requirements

Chapter 4 - ARARs

Chapter 5 - Site History and Investigations

Chapter 6 - Site Geology and Hydrogeology

Chapter 7 - Groundwater Extraction System

Chapter 8 - Groundwater Treatment System

Chapter 9 - Groundwater Recharge System

As noted above, Chapter 4 does not include groundwater extraction and treatment portions of the remedy, and Chapters 7 and 8 are not included.

Volumes 2 and 3: Volumes 2 and 3 present analysis and design information on the surface water management for the Site:

Chapter 10 - Surface Water Management

Volume 4: Volume 4 presents design information for the soils and sediments portion of the remedy, as follows:

Chapter 11 - Permeable Cover

Chapter 12 - Impermeable Cover

Chapter 13 - Streams and Wetlands Sediment Remediation

Volume 5: Volume 5 presents design information for streams and wetlands impact mitigation, the gas portion of the remedy, and information related to the post-remediation activities and controls, as follows:

Chapter 14 - Streams and Wetlands Impact Mitigation

Chapter 15 - Gas Collection System

Chapter 16 - Gas Treatment System

Chapter 17 - Institutional Controls

Chapter 18 - Site Planning

Chapter 19 - Operations and Maintenance Plan

As noted above, Chapter 17 is not included and Chapter 19 does not include groundwater extraction and treatment portions of the remedy.

Volume 6: Volume 6 presents the Contract Documents and Specifications for construction of all elements of the Remedy excluding the groundwater extraction and treatment systems.

Volume 7: Volume 7 presents the drawings associated with Chapters 5, 9, and 11.

Volume 8: Volume 8 presents the drawings associated with Chapters 12 through 16.

Each volume of the report contains a Table of Contents for both the total report and the volume. Each chapter of the report (except Chapters 1 and 2) begins with a detailed Table of Contents for the chapter. References, tables, figures, and appendices for each chapter of the report are found at the end of that chapter.

REFERENCES

Golder, see Golder Associates Inc.

Golder Associates Inc., 1990a. Remedial Design Work Plan, Industri-Plex Site, Woburn, MA, July.

Golder Associates Inc., 1990b. Preliminary Design Report (30% Design), Industri-Plex Site, Woburn, MA, September.

Golder Associates Inc., 1991a. Preliminary Design Report (30% Design) Response to Comments, Industri-Plex Site, Woburn, MA, January.

Golder Associates Inc., 1991b. Preliminary Design Supplement Report, (2 Volumes), Industri-Plex Site, Woburn, MA, February.

Golder Associates Inc., 1991c. 60% Design Report, (9 Volumes), Industri-Plex Site, Woburn, MA, April.

Golder Associates Inc., 1991d. 60% Design Report Response to Comments, Industri-Plex Site, Woburn, MA, July.

Golder Associates Inc., 1991e. 95% Design Report, (6 Volumes), Industri-Plex Site, Woburn, MA, August.

Golder Associates Inc., 1991f. 95% Design Report Response to Comments, Industri-Plex Site, Woburn, MA, November.

Golder Associates Inc., 1991g. 100% Design Report, Part I, (8 Volumes), Industri-Plex Site, Woburn, MA, December.

Industri-Plex Site Remedial Trust, 1992. Letter from D.M. Light to Joseph N. DeCola (USEPA) and Jay Naparstek (MDEP) dated April 3, 1992.

USEPA, see U.S. Environmental Protection Agency.

U. S. Environmental Protection Agency, 1986. Record of Decision, Industri-Plex Site, Woburn, MA, September.

U. S. Environmental Protection Agency, 1989. Industri-Plex Site Consent Decree, Civil Action No. 89-0196-MC, April.

U. S. Environmental Protection Agency, 1991a. Letter from Paula Fitzsimmons to Warren Smull (ISRT) dated June 27, 1991.

U. S. Environmental Protection Agency, 1991b. Letter from Paula Fitzsimmons to Warren Smull (ISRT) dated June 9, 1991.

CHAPTER 2

CONSENT DECREE REQUIREMENTS

CHAPTER 2

CONSENT DECREE REQUIREMENTS

The Consent Decree (USEPA, 1989) entered into between the Agencies and the Settlers defines the work that is to be undertaken at the Site. This definition is within the Consent Decree as well as within the Remedial Design/Action Plan (RDAP) which is integrated into the Consent Decree as Appendix I.

While the Consent Decree, the RDAP, and the Record of Decision (USEPA, 1986, 1989) should be consulted for specific definition of the remedies to be implemented at the Industri-Plex Site, the RDAP generalizes the remedies as follows:

> The remedial action for soils, sediments and sludges contaminated with Hazardous Substances, other than those emitting odors, shall include site grading, capping with a permeable soil cover, excavation, dredging, and/or consolidation for all areas containing Hazardous Substances at concentrations above established action levels, and development of Institutional Controls for all areas containing Hazardous Substances at greater than background levels to ensure the long-term effectiveness of the remedial action....
>
> The remedial action for control of air emissions is intended to mitigate the release or threat of release of Hazardous Substances, including odors associated with decaying hide waste, in the East Hide Pile...The remedial action shall consist of stabilizing the side slopes of the East Hide Pile, installing a gas collection layer, capping with a synthetic membrane to establish impermeability, and soil cover (in accordance with Attachment A [of the RDAP]), and treating gaseous emissions with either activated carbon or thermal oxidation. EPA in consultation with the Commonwealth will approve the final decision as to which gas treatment system to install after the impermeable cover and gas collection system reach equilibrium. Settlers shall operate a temporary gas

> treatment system and shall monitor gas generation and pile settlement until the pile has reached equilibrium. The final decision regarding the permanent gas treatment system will be to provide the most efficient and cost effective long-term remedy to the emission of odors and other Hazardous Substances based on the characteristics of the gaseous discharge and other engineering criteria established during the Remedial Design process. EPA in consultation with the Commonwealth will specify the final treatment decision in a subsequent document...
>
> Settlers shall design and implement an interim groundwater remedy that shall consist of several interceptor/recovery wells located to capture the identified plumes of Hazardous Substances (benzene and toluene) migrating in groundwater, construction of a treatment system, and operation and maintenance of these remedial components until the appropriate performance standards are achieved...Settlers shall pretreat recovered groundwater to control odors and to remove dissolved or suspended Hazardous Substances, and shall subject the recovered groundwater to air stripping to remove volatile Hazardous Substances. Settlers shall during Remedial Design identify appropriate performance standards for groundwater and effluent water quality and shall submit these proposed performance standards to EPA and the Commonwealth for review and approval. The treated effluent shall be discharged via a subsurface leaching pit to be located on-Site in an upgradient portion of the aquifer....

These Consent Decree requirements form the basis upon which the Remedial Design Work Plan (Golder, 1990) was developed.

REFERENCES

Golder, see Golder Associates Inc.

Golder Associates Inc., 1990. Remedial Design Work Plan, Industri-Plex Site, Woburn, MA, July.

USEPA, see U. S. Environmental Protection Agency.

U.S. Environmental Protection Agency, 1986. Record of Decision, Industri-Plex Site, Woburn, MA, September.

U.S. Environmental Protection Agency, 1989. Industri-Plex Site Consent Decree, Civil Action 89-0196-MC, April.

CHAPTER 3

REMEDIAL DESIGN WORK PLAN REQUIREMENTS

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CHAPTER 3
REMEDIAL DESIGN WORK PLAN REQUIREMENTS

3.1 WORK PLAN REQUIREMENTS

In this chapter, all content requirements outlined in the Remedial Design Work Plan (RDWP; Golder, 1990) for each chapter of the Final (100%) Design Report are reviewed. For all parts of the remedies, the RDWP requires completion of all Remedial Design activities, submittal of all final plans, final bid documents, specifications for Remedial Action, the final Operations and Maintenance Plan, and the contractor short list. The contractor short list has been provided by ISRT in a separate submittal to this report.

3.2 ARARs

The RDWP defines that the 100% Design Report will include documentation of the analysis of "the conformance of the remedial design with the ARARs specific to this Site" together with a response to the comments of the Agencies on the 95% draft. This information is presented in Chapter 4 of this report. Due to Agency defined deferrals, the analysis excludes all elements of the groundwater extraction and groundwater treatment systems.

3.3 GROUNDWATER EXTRACTION SYSTEM

The RDWP defines that the groundwater extraction system design portion of the 100% Design Report includes final extraction well locations and equipment sizing, instrumentation, controls, and specifications. The Agencies have directed the deferral of submission of this information, and it will be included in Part II of the 100% Design Report. However, a discussion of the Site Geology and Hydrogeology is included in Chapter 6 of this report.

3.4 GROUNDWATER TREATMENT SYSTEM

The RDWP defines that the groundwater treatment system design portion of the 100% Design Report includes the following:

1. Review of groundwater analytical data,
2. Determination of treatment system flow rate,
3. Completion of flow diagram,
4. Completion of equipment specifications for all tanks, piping, pumps, agitators, air stripper, filters, and instrumentation, and
5. Treatment system structural design.

The Agencies have directed the deferral of the submission of this information while further treatability testing is completed. The final groundwater treatment system design will be presented in Part II of the 100% Design Report, to be submitted at a later date.

3.5 GROUNDWATER RECHARGE SYSTEM

The RDWP defines that the groundwater recharge system design portion of the 100% Design Report includes the following:

1. Final recharge basin design,
2. Pump sizing,
3. Recharge system capacity, and
4. Soil infiltration capacity.

This design information is presented in Chapter 9 of this report. The design elements of the groundwater recharge system are integrated in the Specifications contained in Volume 6 and the Design Drawings included in Volume 7.

3.6 PERMEABLE COVER

The RDWP defines that the permeable cover design portion of the 100% Design Report includes the following:

1. Definition of the stabilization method for the West Hide Pile,

2. Final definition of cover extent determined from Pre-Design Investigation (PDI) and previous data, including type of cap or cover and locations and concentrations of Hazardous Substances on each Landowner's property,

3. Type of cap or cover, and

4. Areas where excavation of Hazardous Substances and replacement with clean backfill would be appropriate.

This information is presented in Chapter 11 of this report. Site drainage analyses are contained in Chapter 10. The design elements of the permeable cover are integrated in the Specifications contained in Volume 6 and the design drawings included in Volume 7.

3.7 IMPERMEABLE COVER

The RDWP defines that the impermeable cover design portion of the 100% Design Report shall include the following:

1. Final designs of slopes, cover section, and stabilization mechanism, including stabilizing medium location and sections,

2. Definition of cap section and extent,

3. Grading plan, and

4. Gas vent spacing.

This information is presented in Chapter 12, Volume 6, and Volume 8 of this report.

3.8 STREAMS AND WETLANDS REMEDIATION

The RDWP defines that the streams and wetlands remediation portion of the 100% Design Report includes the following:

1. Development of final sediment excavation methodology,
2. Sections for wetlands revitalization,
3. Additional remediation and/or revitalization techniques,
4. Monitoring plan, and
5. Definition of functionality goals.

This information is included in Chapters 13, 14, and 19, and Volumes 6 and 8 of this report.

3.9 GAS COLLECTION SYSTEM

The RDWP defines that the gas collection system portion of the 100% Design Report will include the final gas system design package including final determination of gas flow rate and final selection of piping. This design information is presented in Chapter 15, Volume 6, and Volume 8 of this report.

3.10 GAS TREATMENT SYSTEM

The RDWP defines that the gas treatment system design portion of the 100% Design Report will include the following:

1. Determination of volatile organic compound (VOC) removal requirements,
2. Determination of allowable air loading,
3. Development of final flow diagrams,
4. Determination of treatment equipment specifications, and

5. Final piping, instrumentation, and equipment design/specifications.

This design information is presented in Chapter 16, Volume 6, and Volume 8 of this report.

3.11 INSTITUTIONAL CONTROLS

The RDWP defines that the institutional controls portion of the 100% Design Report shall include the following:

1. Identification and summary of institutional control requirements and ARARs,

2. Definition of land categories and anticipated land disturbances,

3. Definition of control levels applicable to particular land disturbances and categories,

4. Identification, analysis, and recommendation of the legal mechanisms for imposing, implementing, and enforcing institutional controls,

5. Final plan identifying Site land categories requiring institutional controls, and

6. Final report on institutional controls implementation, inauguration, and administration program (including implementation documents, and Landowner Guide outlining operation of institutional controls).

The Agencies have deferred the completion of their review of the Institutional Controls chapter of the 60% Design Report (Golder, 1991b). The Agencies have also directed that submittal of the Institutional Controls chapter of the 100% Design Report be deferred.

3.12 SITE PLANNING

The RDWP defines that the site planning portion of the 100% Design Report shall include the following:

1. Final master drainage plan, grading, lot sizes, and landscaping,

2. Final utility layout plan, and

3. Completion of Master Plan Options.

This information is presented in Chapters 11 and 18, and Volume 8 of this report.

3.13 OPERATIONS AND MAINTENANCE PLAN

The RDWP defines that the 100% Design Report will include the final Operations and Maintenance (O&M) Plan. The O&M Plan is contained in Chapter 19 of this report. Due to Agency defined deferrals, the O&M Plan does not address the groundwater extraction and treatment systems.

REFERENCES

Golder, see Golder Associates Inc.

Golder Associates Inc., 1990. Remedial Design Work Plan, Industri-Plex Site, Woburn, MA, July.

Golder Associates Inc. 1991a. 95% Design Report, Industri-Plex Site, Woburn, MA, August.

Golder Associates Inc., 1991b. 60% Design Report, Industri-Plex Site, Woburn, MA, April.

CHAPTER 4

ARARS

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CHAPTER 4

ARARs

4.0 CONFORMANCE OF DESIGN WITH THE APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS ("ARARS")

4.1 INTRODUCTION

The Consent Decree requires that the final (100%) design submittal include the final analysis and supporting documentation of the conformance of the design with the identified Applicable or Relevant and Appropriate Requirements ("ARARs"), as well as the response to comments on the draft final (95% Design) submittal ("95% Design Comments") (Appendix I, Remedial Design/Action Plan ("RD/AP"), p. 18). This submittal contains the final analysis of the compliance of the design with identified ARARs and a summary response to the 95% Design Comments. A more detailed response to the 95% Design Comments was included in the November 1, 1991, "95% Design Report--Response to Comments," (Golder et al, 1991a) Section 4 of which is incorporated herein by reference.

This analysis will reiterate the ARARs previously identified, indicate those sections of the design which are affected by the ARARs identified, and discuss how the final design conforms to the identified ARARs. Three types of ARARs will be discussed: chemical-specific requirements, action-specific requirements and location-specific requirements. Chemical-specific requirements are triggered by the presence or emission of a chemical substance; action-specific requirements are triggered by a particular remedial action; and location-specific requirements are triggered by a vulnerable or protected location.

The identification of ARARs involved a two-step process, applied both to federal and to more stringent state requirements. First, all potential ARARs were analyzed to determine which are legally applicable. Applicable requirements are "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site." 40 C.F.R. § 300.5.

Second, requirements that are not legally applicable were analyzed further to determine whether they are relevant and appropriate. "Relevant and appropriate" requirements are those that, while not legally applicable, "address problems or situations sufficiently similar to those encountered at the CERCLA Site that their use is well suited to the particular site." 40 C.F.R. § 300.5. Eight factors are addressed in determining whether a particular requirement is relevant and appropriate (40 C.F.R. § 300.400 (g)(2)):

(i) The purpose of the requirement and the purpose of the CERCLA action;

(ii) The medium regulated or affected by the requirement and the medium contaminated or affected at the CERCLA site;

(iii) The substances regulated by the requirement and the substances found at the CERCLA site;

(iv) The actions or activities regulated by the requirement and the remedial action contemplated at the CERCLA site;

(v) Any variances, waivers, or exemptions of the requirement and their availability for the circumstances at the CERCLA site;

(vi) The type of place regulated and the type of place affected by the release or CERCLA action;

(vii) The type and size of structure or facility regulated and the type and size of structure or facility affected by the release or contemplated by the CERCLA action; and

(viii) Any consideration of use or potential use of affected resources in the requirement and the use or potential use of the affected resource at the CERCLA site.

The format of this ARARs analysis corresponds to two distinct remedial activities at the Site: 1) capping and controlling collected gases from the East Hide Pile; and 2) covering soils and removing and/or covering sediments containing arsenic, lead, or chromium at or above the Consent Decree action levels to prevent physical contact with them. For purposes of clarity, the remedy to prevent contact with soils and sediments will be separated into a soils section and a sediment section. The Consent Decree also requires groundwater remediation. Design work for this remediation step is ongoing and will be submitted in Part II of this 100% Design Report at a later date, pursuant to an agreed-upon extension.

4.2 SITE OPERATIONS

4.2.1 Identified ARARs

Site remedial activities are subject to the Occupational Safety and Health Administration's ("OSHA") hazardous waste operations and emergency response standard for environmental clean-up operations. 29 C.F.R. § 1910.120(a)-(n) (1988). OSHA's hazardous waste operations standard specifies the employee protection activities with which remedial response action plans must comply. These activities are as follows:

-- Develop a safety and health program incorporating all the elements of the standard. 29 C.F.R. § 1910.120 (b) (1988).

-- Characterize the Site to identify Site hazards and to aid in the selection of the appropriate personal protective equipment. 29 C.F.R. § 1910.120 (c) (1988).

-- Develop a Site control program for preventing contamination of employees. 29 C.F.R. §1910.120 (d) (1988).

-- All employees shall have a minimum 40 hours of initial off-site instruction and three days of directly supervised field experience before job assignment. 29 C.F.R. § 1910.120 (e) (1988).

-- Establish a medical surveillance program for affected employees. 29 C.F.R. § 1910.120 (f) (1988).

-- Provide engineering controls, work practices and personal protective equipment for employee protection. 29 C.F.R. § 1910.120 (g) (1988).

-- Develop an air monitoring program to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on site. 29 C.F.R. § 1910.120 (h) (1988).

-- Develop and implement a Site safety and health plan. 29 C.F.R. § 1910.120 (i) (1988).

-- Handle drums and containers according to specified procedures. 29 C.F.R. § 1910.120 (j) (1988).

- -- Develop and implement a decontamination procedure. 29 C.F.R. § 1910.120 (k) (1988).
- -- Develop an emergency response plan. 29 C.F.R. § 1910.120 (l) (1988).
- -- Illuminate work areas to specified brightness. 29 C.F.R. § 1910.120 (m) (1988).
- -- Provide adequate sanitation for Site employees. 29 C.F.R. § 1910.120 (n) (1988).

In response to the 95% Design Comments, it should be noted that the foregoing citations are regulations in effect on April 24, 1989, the date the Consent Decree for this site was entered by the court. In addition, the Cited provisions incorporate 29 C.F.R. § 1910.120(a)(2)(ii), which provides that all requirements of 29 C.F.R. Parts 1910 and 1926 apply to hazardous waste operations where these requirements are more stringent than 29 C.F.R. § 1910.120.

4.2.2 Design Conformance With ARARs

The technical specifications for the remedial construction contract, found in Section 01564 of Volume 6, require that the remedial contractor comply with 29 C.F.R. § 1910.120 (1988). These specifications characterize site hazards to enable the contractor to select appropriate personal protective equipment and to prepare an adequate health and safety plan for Site remedial activities. References are also given to the remedial investigation documents that further define and describe Site hazards.

4.3 GROUNDWATER REMEDY

The design work for this remedy has been separated from the general remedy and is ongoing and will be submitted in Part II of this 100% Design Report at a later date, pursuant to an agreed-upon extension.

4.4 AIR REMEDY FOR THE EAST HIDE PILE

The ROD specifies three remedial objectives for the East Hide Pile: 1) eliminate the potential for direct contact with heavy metal wastes; 2) stabilize the side slopes; and 3) eliminate the emission of obnoxious odor. ROD, p. 48. To achieve these objectives, the remedial action consists of stabilizing the side slopes, installing a gas collection layer, capping with an impermeable synthetic membrane, and controlling collected gaseous emissions. Each of these activities will trigger the imposition of ARARs.

4.4.1 Chemical-Specific Requirements

4.4.1.1 Earth-Moving Operations

4.4.1.1.1 Identified ARARs

Earth-moving operations may generate dust or odor. Massachusetts requires that no person may generate dust or odor so as to create a nuisance, be injurious to human or animal life, vegetation, or property, or unreasonably interfere with comfortable enjoyment of life and property. 310 C.M.R. § 7.09(1) and 310 C.M.R. § 7.00 Definitions.

In response to the 95% Design Comments, it bears noting that the National Ambient Air Quality Standards (NAAQS) relate to the quality of the Commonwealth's ambient air rather than to actual Site emissions. Actual emission limits and specific Site operational standards are set by state law and regulations, which are embodied in the Massachusetts State Implementation Plan ("SIP") approved by USEPA. The SIP is designed to cause the Commonwealth's air quality to attain the NAAQS, and the relevant SIP-approved regulations for earth moving operation are cited above.

Relevant and appropriate Massachusetts rules for hazardous waste Treatment Storage and Disposal (TSD) facilities require taking appropriate measures to avoid the detection off-Site of objectionable odors. 310 C.M.R. § 30.602(6).

4.4.1.1.2 Design Conformance With ARARs

Odor air quality standards were set for Site operations in the "Pre-Design Investigation Task A-1, Baseline Air Survey, Interim Final Report" submitted to USEPA on May 14, 1991 ("Baseline Air Survey"). Air quality standards for health-based dust emission levels are set in Appendix 4-A to this Report. Procedures for ensuring that area air quality is maintained during earth-moving operations are described in the technical specifications for the remedial construction contract. Specification section numbers 01562 and 01563 require that contractors performing remedial action activities must implement dust and odor control measures when air monitoring results show that the specified air quality standards are exceeded.

4.4.1.2 Emission Control Device

4.4.1.2.1 Identified ARARs

Odors from the East Hide Pile will be controlled with a thermal oxidation flare. In response to the 95% Design Comments, a discussion of the Agencies' concerns related to the choice of a thermal oxidation flare is included in Chapter 16 of this report.

For odor emission control devices, the applicable emissions ARAR is the Massachusetts odor prohibition explained in section 4.4.1.1.1 above. In response to the 95% Design Comments, it is noted that the odor air quality standard set to comply with this ARAR was determined in the "Pre-Design Investigation Task A-1, Baseline Air Survey, Interim Final Report" (Golder, 1991b) submitted to USEPA on May 14, 1991.

The point of compliance for this odor air quality standard is the north fenceline, the closest Site boundary.

The gas collection system will also collect volatile organic compounds ("VOCs"). The Record of Decision ("ROD") for the Site states that the NAAQS are applicable to operations at the Site. ROD, pp. 74, 76, and 80. These NAAQS levels relate to the quality of the ambient air rather than to actual Site emissions. They are applicable to the Site insofar as they set standards for national air quality. Actual emission limits and specific standards for Site operations are set by state law and regulation, as embodied in the Massachusetts SIP, approved by USEPA. The SIP is designed to cause the Commonwealth's air quality to attain the NAAQS.

As part of its approved SIP regulations, Massachusetts requires that Best Available Control Technology ("BACT") be installed to control gaseous emissions from the hide pile. In this case, BACT was determined in the ROD, which specified the use of either a thermal oxidation unit or a carbon adsorption system as the emission control technology.

4.4.1.2.2 Design Conformance With ARARs

Emissions from the gas collection system will be controlled using a thermal oxidation flare which meets the ROD-determined BACT standard.

Odor air quality standards were set for Site operations in the Baseline Air Survey (Golder, 1991b). Air modeling results (included as Appendix 4-B to this report) indicate that flare emissions will not result in the emission of odors greater than the odor threshold specified in the Baseline Air Survey. In response to the 95% Design Comments, the air dispersion modelling protocol, together with all input and output data, are presented and discussed in Appendix 4-B.

4.4.2 Action-Specific Requirements

4.4.2.1 Construction of Impermeable Cap

4.4.2.1.1 Identified ARARs

The Remedial Design/Action Plan provides specifications for the cap over the East Hide Pile. Relevant and appropriate to the construction of that cap is 40 C.F.R. § 264.303(a)(1), which requires monitoring and inspection during cap construction to assure uniformity and lack of damage and imperfections. Massachusetts has a similar requirement. 310 C.M.R. § 30.624(1).

Relevant and appropriate to the maintenance of the cap are the requirements to make repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events, and to conduct periodic inspections of the run-off control system to prevent erosion. 40 C.F.R. § 264.310(b)(1) and (4) (mirrored in state regulations, 310 C.M.R. § 30.633(2B)(a) and (e)). Maintenance of the security system where necessary to prevent access to the hide pile is also required under the relevant and appropriate post-closure provisions in 40 C.F.R. § 264.117(b) (mirrored in state regulations, 310 C.M.R. § 30.514(1)).

4.4.2.1.2 Design Conformance With ARARs

The inspection procedures to be followed during impermeable cap construction are found as part of the technical specifications for the Remedial Construction Contract in Sections 02242, 02595, 02597, 02598, and 02599 of Volume 6. These procedures will ensure that all seams of the HDPE cover are tight and that there are no holes, punctures or blisters in the cover. The soil-based section of the cover will be inspected for imperfections, including lenses, cracks, channels, root holes or other structural defects that might cause an increase in the permeability of the cover.

In response to the 95% Design Comments, it should be noted that the quality assurance procedures and methods are included with the technical specifications. Relevant sections include: Backfill & Fill (Section 02223), Impermeable and Permeable Cover Fill (Section 02242) and Flexible Membrane Cover (Section 02597). Permeability of the synthetic membrane material is controlled during the manufacture of the material, and through on-site inspection.

The Operations and Maintenance Plan, Chapter 19, provides that the impermeable cover will be inspected quarterly for the first three years after the cover has been established and annually thereafter. Items included in the inspection are the integrity of the cap, vegetative cover, and drainage structures. The Operations and Maintenance Plan describes the measures taken to maintain the security system around the East Hide Pile. The fence around the East Hide Pile will be inspected monthly.

4.4.2.3 Gas Collection System

4.4.2.3.1 Identified ARARs

Massachusetts has a relevant and appropriate requirement of long-term maintenance of gas collection systems and controls. 310 C.M.R. § 30.633(2B)(g). Maintenance is required for 30 years, unless a shorter period is sufficient to protect public health, safety, or welfare, or the environment. 310 C.M.R. § 30.592B(2).

4.4.2.3.2 Design Conformance With ARARs

Chapter 19 includes the maintenance plan for the hide pile gas collection system and controls. The collection system will be inspected monthly. The pneumatic nitrogen supply system will be inspected at a minimum per the schedule recommended by the manufacturer.

4.4.3 Location-Specific Standards

4.4.3.1 Identified ARARs

Under the Massachusetts Solid Waste Facilities Site Regulations (310 C.M.R. § 16.00), control of the hide pile gas emissions with a flare may be considered treatment of a solid waste subject to site suitability criteria. 310 C.M.R. §§ 16.02 and 16.05. Although the procedural aspects of this law do not apply, the following site suitability criteria apply:

-- Do not locate within an Interim Wellhead protection area, in Zone II of a potential public drinking water supply, less than 500 feet upgradient or less than 250 feet of a surface drinking water supply, or within 250 feet of a private drinking water supply. 310 C.M.R. § 16.40(3)(d)1-4;

-- Locate where the maximum high groundwater table is greater than two (2) feet from the ground surface. 310 C.M.R. § 16.40(3)(d)5;

-- Do not locate the facility within 250 feet of an occupied dwelling, prison, health care facility or school. 310 C.M.R. § 16.40(3)(d)6;

-- Provide a 100 foot buffer between the facility and active farmland. 310 C.M.R. § 16.40(4)(a);

-- Do not damage endangered species or significant wildlife habitats. 310 C.M.R. § 16.40(4)(c);

-- Do not locate in an area of Critical Environmental Concern. 310 C.M.R. § 16.40(4)(d);

-- Anticipated emissions must meet state and federal air quality standards. 310 C.M.R. § 16.40(4)(e); and

-- Do not operate to create a nuisance. 310 C.M.R. § 16.40(4)(f).

4.4.3.2 Design Conformance With ARARs

The hide pile gas treatment facility will be located adjacent to and slightly east of the East Hide Pile as shown on Sheet 15-1. This map shows that there is no current development or active farmland within 250 feet of the proposed location of the gas thermal oxidation unit. There are no surface or groundwater public or private drinking water supplies located within 500 feet of the unit. Groundwater investigation of the Site has shown that groundwater is located at least 3 feet under the ground surface. The area has not been designated as an area of Critical Environmental Concern. All air emissions will meet ARAR standards and the thermal oxidation flare will be shrouded so that it will not be a nuisance to surrounding land uses. Although areas of the Site are included on the Massachusetts National Heritage Program's Estimated Habitat Map for the Mystic Valley Amphipod, a Commonwealth-listed Species of Concern, extensive sampling of the area has determined that the Site does not support populations of the Mystic Valley Amphipod and location of the thermal oxidation flare on the Site will not, therefore, have an impact on this species.

4.5 REMEDY FOR SOILS

On-Site soils containing lead, arsenic or chromium at or above the action levels established by the Consent Decree are to be covered with permeable soils. Institutional controls will be established to ensure the lasting effectiveness of this remedy. This section will discuss ARARs conformance related to covering soils not located in water bodies or wetlands; ARARs conformance regarding sediments located in surface water bodies or wetlands are discussed in the next section. ARARs pertain to three aspects of soil covering activities: 1) design and construction of soil cover; 2) air emissions from construction activities; and 3) post-construction activities.

4.5.1 Chemical-Specific Requirements

There are no chemical-specific ARARs related to covering soils. As prescribed by the RD/AP, however, soil covering will occur where soils contain metals at or above the following levels: 300 parts per million ("ppm") arsenic, 600 ppm lead, and 1000 ppm chromium.

4.5.2 Action-Specific Requirements

4.5.2.1 Identified ARARs

The RD/AP specifies the cover design to be used at the Site, and sets forth a specific procedure to be used to determine an alternate cover design. RD/AP, pp. 3-4.

Earth-moving activities related to cover construction will result in dust emissions. The Massachusetts requirement that no person may generate dust or odor so as to create a nuisance, be injurious to human or animal life, vegetation, or property, or unreasonably interfere with comfortable enjoyment of life and property is applicable to these emissions. 310 C.M.R. § 7.09(1) and 310 C.M.R. § 7.00 Definitions.

Because soil containing metals at or above the action levels will remain on-Site after remedial activities are completed, further efforts will be undertaken to ensure the integrity of the remedy. The following standards are relevant and appropriate to such post-construction activities. The language of these provisions relates to hazardous waste. Because the wastes remaining on Site are not hazardous wastes, the use of the term hazardous waste in these regulations is inappropriate. The provisions listed below are appropriate for use where the soils contain metals at or above the action levels specified in the RD/AP.

-- Security requirements of 40 C.F.R. § 264.14(a) and 310 C.M.R. § 30.514(1) can be continued where hazardous wastes remain exposed or where access by the public or domestic livestock may pose a hazard to human health. 40 C.F.R. § 117(b) and 310 C.M.R. § 30.592B(4).

-- Post-closure use of the property upon which hazardous wastes remain must not be allowed to disturb the integrity of the final cover, or the function of the monitoring facilities unless the disturbance is necessary to the property use and will not increase potential harm to human health or environment or unless the disturbance is necessary to reduce a threat to human health or the environment. 40 C.F.R. § 264.117(c) and 310 C.M.R. § 30.592B(5).

-- Record a notation to the deed of the property that will in perpetuity notify any potential purchaser of Site property that the land contains hazardous waste and its use is restricted. The type and amount of hazardous waste on the property must also be recorded. 40 C.F.R. § 264.119(b)(1) and 310 C.M.R. § 30.594(1).

-- Prior approval from USEPA and MDEP is needed before hazardous wastes may be removed from the property. 40 C.F.R. § 264.119(c) and 310 C.M.R. § 30.595.

-- The cover must be maintained and repairs made as necessary. 40 C.F.R. § 264.310(b)(1) and 310 C.M.R. § 30.633(2B)(a).

-- Run-on and run-off should be prevented from damaging the final cover. 40 C.F.R. § 264.310 (b)(4) and 310 C.M.R. § 30.633(2B)(e).

-- Surveyed benchmarks should be protected and maintained. 40 C.F.R. § 264.310(b)(5) and 310 C.M.R. § 30.633(2B)(h).

-- A post-closure cost estimate must be prepared giving the annual cost of post-closure monitoring and facility maintenance. 40 C.F.R. § 264.144(a) and 310 C.M.R. § 30.905(1).

-- A financial assurance mechanism must be provided for the costs of post-closure care. 40 C.F.R. § 264.145 and 310 C.M.R. § 30.906.

4.5.2.2 Design Conformance With ARARs

Cover design: The cover design specified in Chapter 11 of this report conforms to the alternate cover design that was authorized by the RD/AP and specifically approved by the USEPA (letter to Industri-Plex Site Remedial Trust dated September 1, 1989).

Cover construction: A health-based air quality standard for dust emissions generated during cover construction to conform to the applicable Massachusetts prohibition on the emission of dust that is injurious to human or animal life is set out in Appendix 4-A. Section 01562 of Volume 6 contains those specifications for the construction contract which require the contractor to comply with the developed standard. These specifications require the imposition of dust control measures if air monitoring results show that dust emissions during Site remediation activities exceed the health based dust emission standard. Similarly, Section 01563 of Volume 6 contains the remedial action contract specifications which require that odor control measures be implemented if the odor air quality standard specified in the Baseline Air Survey is exceeded.

Post-construction: The ARARs identified with respect to post-construction aspects of the soils remedy are achieved by: (1) the Institutional Controls including the Restrictive Document included therein; and (2) the Operations and Maintenance ("O&M") Plan submitted as Chapter 19 of this report. Revisions to the Institutional Controls and the Restrictive Document are ongoing and will be submitted at a later date, pursuant to an agreed-upon extension. The O&M Plan addresses cover maintenance and repair, monitoring of drainage structures to prevent run-on and run-off from damaging the final cover, a post-closure cost estimate, and a financial assurance mechanism.

4.5.3 Location-Specific Requirements

The location-specific ARARs are those related to activities in surface water or wetlands, as detailed in the next section.

4.6 REMEDY FOR SEDIMENTS

Sediments containing metals at or above the action levels specified in the RD/AP will be dredged from Site surface waters or covered with culverts, or fill material. Some of the sediments containing metals at or above the action levels are in wetland areas, others are in the streams on the Site. ARARs are triggered both by dredging and excavation activities and by the discharge of fill material into the water body. For ARARs purposes, placing culverts is treated the same as the discharge of fill material.

4.6.1 Introduction

4.6.1.1 Definitions Relevant to the Application of ARARs

The applicability of potential ARARs depends on whether Site surface water bodies meet particular regulatory definitions. If Site surface water bodies do not fit the regulatory definition, then the potential ARAR will not be applicable, and further analysis will be needed to determine if the requirement is relevant and appropriate.

Massachusetts regulates activities in rivers or streams for which public funds have been expended for stream clearance, channel improvement, or flood control. M.G.L. c. 91 s. 12A. Insofar as on-Site streams and rivers meet this criterion, the substantive waterway requirements described below apply to activities in these streams and rivers.

Federal and state definitions of wetlands differ. Where a federal wetland ARAR is identified, that ARAR will pertain to specified activities in wetlands as defined in federal law. Executive Order 11990 § 7(c), 40 C.F.R. Part 6, Appendix A § 4(j), 33 C.F.R. § 328.3(b), 40 C.F.R. § 230.3(t). Where state wetland ARARs are identified, they will pertain to specified activities in areas subject to the Commonwealth's wetlands law. M.G.L. c. 131 s. 40. The

Commonwealth further defines and delineates inland wetlands into four categories: 1) land under water bodies; 2) banks; 3) bordering vegetative wetlands; and 4) land subject to flooding. 310 C.M.R. § 10.00, Part III. Each wetland category is treated differently because each category is presumed to perform different functions.

4.6.1.2 Site Water Bodies Meeting Specified Definitions

The "Floodplain and Wetlands Assessment" for the Industri-Plex Site prepared in July 1986 by Wetland Management Specialists, Inc. ("Wetlands Assessment") delineated several on-Site wetlands. Each wetland is further delineated by Commonwealth category in Table 14-1 of this report. The functional values of those wetlands requiring sediment remediation have been assessed as discussed in Chapter 14 of this report. The identified wetlands subject to sediment remediation or restoration to mitigate losses of wetland functions elsewhere on-Site are as follows:

Wetland 1C — Man-made pond situated between the East and West Hide Piles at the northern end of the Site and consisting of mostly open water with a vegetated fringe.

Wetland 2A — Channelized tributary of the Aberjona River which flows southeast from Wetland 1C.

Wetland 2B — Channelized section of the Aberjona River with steep, heavily vegetated banks.

Wetland 3A — Northern branch of the Aberjona River and adjacent forested and vegetated areas.

Wetland 7A & B — Man-made lagoons designated as shallow, freshwater marshes.

Wetland 7C — Stormwater runoff channel, heavily vegetated.

Wetland 8	Small emergent wetland with seasonal standing water.
Channelized Streams	Two other on-Site streams will require remediation. The New Boston Street Drainway is a perennial stream. The tributary channel just to the west of the New Boston Street Drainway is also a perennial stream with vegetated banks.

4.6.2 Chemical-Specific Requirements

4.6.2.1 Water Quality Standards

4.6.2.1.1 Identified ARARs

Several different federal and state ARARs point to the application of Massachusetts Water Quality Standards to sediment remedial activities at the Site.

Both federal and Commonwealth law require the maintenance of Commonwealth water quality standards as a prerequisite to the discharge of fill into a water body. Under the federal Clean Water Act ("CWA"), discharge of a pollutant into the waters of the U.S. is regulated. CWA § 301(a). Under CWA § 404, the Army Corps of Engineers is the regulating authority for the discharge of fill material into a water body, but CWA § 404(b)(1) requires that the Corps apply substantive guidelines developed by USEPA. 40 C.F.R. Part 230. The guidelines require that no discharge may cause or contribute, after consideration of disposal Site dilution and dispersion, to violations of any applicable state water quality standard. 40 C.F.R. § 230.10(b)(1).

Commonwealth law also regulates the discharge of any pollutant into the waters of the state. M.G.L. c. 21 s. 43. Discharges subject to federal regulation under CWA § 404 are exempt from state discharge permit rules, but the activity is regulated either under the state waterways or wetlands provisions. 314 C.M.R. § 9.01(2)(c). For dredging and excavation activities in a river, stream, or wetland, a water quality certificate must be issued to certify whether a proposed project will ensure the maintenance or attainment of the Massachusetts Water Quality Standards. 314 C.M.R. § 9.04 (1).

Massachusetts has classified Site surface waters as "Class B Inland Waters." 314 C.M.R. § 4.05, Table 18. The applicable water quality standards for water bodies of this class are described in 314 C.M.R. § 4.03 (4). Water quality at the Industri-Plex Site will be evaluated according to the narrative water quality criteria for the parameter, "Other constituents":

> Waters shall be free from pollutants in concentrations or combinations that:
>
> (a) Exceed the recommended limits on the most sensitive receiving water use;
>
> (b) Injure, are toxic to, or produce adverse physiological or behavioral responses in humans or aquatic life; or
>
> (c) Exceed Site-specific safe exposure levels determined by bio-assay using sensitive species.

314 C.M.R. § 4.03 (4)A.7. Massachusetts uses USEPA water quality criteria established pursuant to CWA § 304 (a)(1) as guidance to determine compliance with the narrative water quality criteria. 314 C.M.R. §§ 4.03 (2) and 3.10 (2)(b)(3). The pertinent water quality criteria are those set for protection against adverse effects on aquatic life (both acute and chronic) and for protection of human life from the adverse properties of the pollutant from ingesting aquatic organisms. These water quality criteria pertain to the water body as a whole, they do not set Site-specific limits.

4.6.2.1.2 Design Conformance With ARARs

Fill activity (including the placement of concrete culverts) will occur in each of the above described wetlands. The purpose of the fill activity is to cover sediments in the wetlands to minimize direct contact with metal containing sediments and to prevent downstream transport of the sediments. The fill activity itself is conducted to improve and protect water quality. Since the remedy will prevent contact with metal-containing sediments, the fill activity will ensure on-Site sediments will not impact water quality.

Measures taken to ensure maintenance of water quality during filling are described in Section 02125 of the technical specifications provided in Volume 6 of this report.

4.6.2.2 Chemical Components of Fill Material

4.6.2.2.1 Identified ARARs

Federal law prohibits the discharge of dredged or fill material which will cause or contribute to significant degradation of the receiving water body. 40 C.F.R. § 230.10(c). Findings of "significant degradation" are based upon factual determinations concerning, among other things, the chemical and biological constituents of the fill material. 40 C.F.R. § 230.11 and 230.60. Evaluation and testing of fill material to determine chemical and biological constituents is not required, however, where a preliminary evaluation of the fill extraction site indicates the fill material is not a carrier of contaminants. 40 C.F.R § 230.60(b).

4.6.2.2.2 Design Conformance With ARARs

Fill material consists of clean soil, or culverts for remediation of sediments in parts of on-Site streams. Testing of the clean soil, or culverts will not be required under the provisions of 40 C.F.R. § 230.60(b). Culverts are normally sufficiently removed from sources of pollution to provide reasonable assurance that they are not carriers of contaminants. Specifications for the fill material found in Sections 02271 and 02937 of Volume 6 also insure that the source of the fill material will be sufficiently removed from sources of pollution to provide reasonable assurance that it is not a carrier of contaminants.

4.6.3 Action-Specific Requirements

4.6.3.1 Wetlands Protection Requirements

4.6.3.1.1 Identified ARARs

The RD/AP requires that wetlands be restored consistent with 40 C.F.R. Part 6, Appendix A, § 6(a)(5). RD/AP, p. 7. USEPA guidelines to comply with Executive Order 11990 are set forth in 40 C.F.R. Part 6, Appendix A. The relevant and appropriate guidelines require that where there is no practical alternative to altering a wetland (or floodplain), the USEPA must act to restore and preserve the natural and beneficial value of the wetland (or floodplain). 40 C.F.R. Part 6, Appendix A, § 6(a)(5).

The Massachusetts Wetlands Protection Act regulates the removal, dredging, filling, or altering of a wetland, or other water body as defined in the Act. M.G.L. c. 131 s. 40. This law and the substantive wetlands standards found in 310 C.M.R. § 10.00 are applicable to both excavation and fill activities at the Site where Site conditions meet the regulatory definition of covered water bodies. As stated earlier, covered water bodies are further broken down into four categories, lands under water bodies, banks, bordering vegetated wetlands, and lands subject to flooding. Each category is presumed to perform certain functions. Unless the presumption is rebutted, activities in each wetland area must be designed to preserve the presumed functions. Where a wetland does not provide a certain function, the presumption is rebutted and activities in the wetland may proceed without regard to that function.

Where the functions cannot be preserved by the activities in the wetland, a variance may be granted where (1) there are no reasonable conditions or alternatives that would allow the project to proceed in compliance with the regulation(s); (2) mitigating measures are proposed that will allow the project to be conditioned so as to contribute to the protection of the interests identified in the Commonwealth's Wetlands Protection Act; and (3) the variance is necessary to accommodate an overriding community, regional, state or national public interest. 310 C.M.R. § 10.58.

4.6.3.1.2 Design Conformance With ARARs

A wetlands function assessment has been performed on those wetlands subject to remediation or restoration to determine the beneficial values of each Site wetland where sediments require remediation or the wetland will be restored to mitigate losses of wetland functions elsewhere on-Site. The results of this assessment are included in Chapter 14 and are summarized here as follows:

Wetland 1C	Moderate rating for biological-wildlife, hydrologic support, floodwater storage, shoreline protection and water quality maintenance values. All other values low.
Wetland 2A&7C	Low values for all wetland functions.
Wetland 2B	Low values for all wetland functions.
Wetland 3A	High ratings for biological function, shoreline protection and water quality protection. Moderate ratings for hydrologic support, groundwater recharge, and educational value. Other values low.

Wetland 7A, 7B	Moderate rating for groundwater recharge and water quality maintenance values. All other values low.
Wetland 8	Moderate rating for hydrologic support and water quality maintenance. All other values low.
Channelized Streams	Low values for all wetland functions.

This wetlands function assessment accomplishes two purposes. First, the assessment describes the beneficial values of each wetland which must be restored or preserved by the remediation, as required by 40 C.F.R. Part 6, Appendix A, § 6(a)(5). Chapter 14 describes how these beneficial values will be restored, preserved, and, in some cases, enhanced by the remedial action.

Second, the assessment provides the information needed to determine whether Site wetlands provide the functions presumed under the Massachusetts wetlands regulations. For each wetland value described as "low" in the wetlands assessment, the Commonwealth function presumption is rebutted. Only those functions which are not rebutted by the assessment are subject to further analysis to determine whether the remedial design will meet the performance standard for the remaining values.

A discussion of how the remedial design will meet the performance standard for the remaining values is contained in Section 14.5.3 of this report. The remedial design has been planned to minimize the effects of the remedial action (required by the ROD) upon the wetlands functions determined by the assessment. In addition, a compensatory wetland area and wetland restoration area will be constructed to compensate for those functions which could not be preserved within the ROD-required remedial action goals.

The remedial design meets Commonwealth wetlands ARARs. Even where some beneficial functions of a particular wetland area must be altered to meet the ROD-required remedial action goals, this alteration meets the standards for a variance from the wetland requirements. First, for the project to proceed, some wetland areas must be altered. The ROD determined that there is no practical remedial alternative that would not impact wetlands (ROD, p. 73). The design has minimized, where possible, impacts on the beneficial values of Site wetlands. Second, mitigating measures are incorporated into the remedial design to fully compensate for all wetland functions altered by the remedy (see Chapter 14). Third, a variance from the wetlands requirements is necessary to accommodate the overriding public interest to protect human health and the environment by remediating the Site.

The remedial activities will also not alter the habitat of a Massachusetts Species of Special Concern as defined in 321 C.M.R. § 8.01. Certain areas of the Site are included in the Massachusetts Natural Heritage Program's Estimated Habitat Map for the Mystic Valley Amphipod (Crangonyx aberrans), a Commonwealth Species of Special Concern. Further investigation has determined, however, that the resource areas subject to Site remediation do not support populations of the Mystic Valley Amphipod (see, Appendix 14-B). The results of this investigation rebut the presumption in 310 C.M.R. § 10.59 that the mapped area is the habitat of a Commonwealth-listed species and, therefore, the remedial activities at the Site will have no short or long term impacts upon a Commonwealth-listed species or its habitat.

4.6.3.2 Discharge of Fill Material

4.6.3.2.1 Identified ARARs

USEPA's substantive guidelines for the placement of fill prohibit such placement where the fill will cause or contribute to significant degradation of the waters of the United States. 40 C.F.R. § 230.10(c). Such degradation includes reduction of the capacity of a wetland to assimilate nutrients, purify water, or reduce wave energy 40 C.F.R. § 230.10(c)(3).

4.6.3.2.2 Design Conformance With ARARs

The ability of each Site wetland to aid in the maintenance of water quality was assessed as part of the wetland function analysis presented in Chapter 14. Where a Site wetland had such function, the design has compensated for the diminution of that function as described in Sections 14.5 and 14.6

REFERENCES

Golder Associates Inc., 1991a. 95% Response to Comments, Industri-Plex Site, Woburn, MA, November.

Golder Associates Inc., 1991b. Baseline Air Survey, Pre-Design Investigation, Interim Final Report, Industri-Plex Site, Woburn, MA, December.

APPENDIX 4-A

DETERMINATION OF DUST (PM10) STANDARD

APPENDIX 4-A

DETERMINATION OF DUST (PM10) STANDARD

SUMMARY

This risk assessment determines a PM10 standard for the Site. The standard reviews health based criteria in calculating the most restrictive standard with a total risk value of 10^{-5}. The risk assessment is separated into the following sections:

I. Baseline PM10, Baseline Metal, and Contemporaneous (During Remedial Activities) Metal Concentrations.

II. PM10 Standard Based Solely on Carcinogenic Metals.

III. PM10 Standard Based Solely on Lead.

IV. PM10 Standard Based Solely on Chromium (III)

V. PM10 Standard Based on the Health Effects of Solely PM10.

VI. Most Restrictive PM10 Standard.

As shown in Section VI, the most restrictive PM10 standard is based on lead. An annual average PM10 standard of 150 μg/m3 and a 24-hour PM10 standard of 450 μg/m3 ensures that the total risk due to carcinogens does not exceed 10^{-5} and that the reference air concentration for lead is not exceeded.

I. Baseline PM10, Baseline Metal and Contemporaneous Metal Concentrations: The USEPA reports the annual PM10 range[1] for the Boston area as 26-36 μg/m3. Conservatively, 36 μg/m3 shall be used for the annual PM10 baseline for the Site.

Metals of concern for the Site are arsenic, chromium and lead. The carcinogens, arsenic and chromium, are normally not found in airborne particulates. Therefore, the baseline concentrations of the carcinogens in the particulates are assumed to be zero. Lead, on the other hand, has been periodically found in airborne particulates in/near cities such as Boston.

[1]USEPA, 1990: 1989 Annual Report on Air Quality in New England, Region I, New England Regional Laboratory, Lexington, MA, July.

However, baseline concentrations of lead in the particulates are not relevant to this assessment, as shown in Section III.

Contemporaneous metal concentrations are levels of metals in the airborne particulates caused by/during the remedial activities. Soil sampling results from the PDI and RI/FS yielded average concentrations[2] for arsenic, chromium and lead at 107 ppm, 165 ppm and 608 ppm, respectively. It is conservatively assumed that these concentrations represent potential contemporaneous concentrations in the airborne particulates.

It is expected that the remedial activities will be complete within three years.

II. PM10 Standard Based Solely on Carcinogenic Metals

This section determines a PM10 standard based solely on arsenic and chromium. In formulating the equations to calculate this standard, the following variables were used:

PM-24hour (μg/m3)	=	24-hour PM10 standard for site during remediation;
PM10 (μg/m3)	=	Annual average PM10 standard for site during remediation;
PM10,As (μg/m3)	=	Annual average PM10 based solely on arsenic concentration;
PM10,Cr (μg/m3)	=	Annual average PM10 based solely on chromium (VI) concentration;
Conc,As (fraction)	=	Arsenic concentration in PM10 particulates during remediation;
Conc,Cr (fraction)	=	Chromium concentration in PM10 particulates during remediation;
PMbase (μg/m3)	=	Baseline annual average PM10 concentration;
Cbase,As (fraction)	=	Baseline arsenic concentration in PM10 particulates; and,
Cbase,Cr (fraction)	=	Baseline chromium concentration in PM10 particulates.

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[2]Average concentrations calculated using 90th percentile metal results from the PDI and RI/FS. Non-detect samples were not considered. One-fifth of excavated soil is assumed from utility corridors (one-third up to 120 inches in depth and two-thirds up to 6 inches in depth) and four-fifths from other areas of the Site with background concentrations of metals.

The USEPA uses slope factors for carcinogens in order to estimate excess risk associated with a particular level. The USEPA has recently issued regulations which establish allowable levels at a 10^{-5} risk level for a lifetime exposure (70 years) from the "Burning of Hazardous Waste in Boiler and Industrial Furnaces" (BIF) rule. For arsenic and chromium (VI) these levels, or risk specific doses (RsDs)[3], are 2.3×10^{-3} µg/m3 and 8.3×10^{-4} µg/m3, respectively.

The following equations establish a 70-year average relationship using the above RsDs (1.0E-05 risk factor) for arsenic and chromium (VI). As stated on page 13 of the ROD, chromium (VI) has not been detected at the Site. However, in this risk assessment, it is conservatively assumed that one-sixth of the chromium is hexavalent. The equations take into account for 67 years of baseline with the 3 years of remedial activities to calculate the <u>total</u> risks associated with each carcinogen for a 70 year lifetime exposure.

$$\frac{[(67yrs)(PMbase)(Cbase,As)]+[(3yrs)(PM10,As)(Conc,As)]}{70\ years} = 2.3xE\text{-}3\ \mu g/m3$$

$$\frac{[(67yrs)(PMbase)(1/6)(Cbase,Cr)] + [(3yrs)(PM10,Cr)(1/6)(Conc,Cr)]}{70\ years} = 8.3xE\text{-}04\ \mu g/m3 \qquad (1)$$

Solving for PM10,As and PM10,Cr below:

$$PM10,As = \frac{0.0537 - (22.33)(PMbase)(Cbase,As)}{(Conc,Ar)}$$

$$PM10,Cr = \frac{0.1162 - (3.72)(PMbase)(Cbase,Cr)}{(Conc,Cr)} \qquad (2)$$

Assuming risk levels for carcinogens to be additive, the following equation calculates the annual PM10 standard (PM10) based on a <u>total</u> risk of 1.0E-05:

$$1.0E\text{-}05 \times \frac{PM10}{PM10,As} + 1.0E\text{-}05 \times \frac{PM10}{PM10,Cr} = 1.0E\text{-}05 \qquad (3)$$

Reducing Equation 3:

[3]Taken from 54 <u>Federal Register</u> 7232, February 21, 1991.

$$\frac{PM10}{PM10,As} + \frac{PM10}{PM10,Cr} = 1 \tag{4}$$

Equation 4 is further reduced below to solve for PM10:

$$1 = \frac{[(PM10,As)+(PM10,Cr)]x(PM10)}{(PM10,As)x(PM10,Cr)}$$

$$\frac{1}{(PM10)} = \frac{PM10,Cr}{(PM10,Cr)x(PM10,As)} + \frac{PM10,As}{(PM10,Cr)x(PM10,As)}$$

$$\frac{1}{(PM10)} = \frac{1}{(PM10,As)} \quad \frac{1}{(PM10,Cr)} \tag{5}$$

Inserting results from Equation 2 for (PM10,As) and (PM10,Cr) into Equation 5, yields:

$$\frac{1}{PM10} = \frac{Conc,As}{0.0537-(22.3)(PMbase)(Cbase,As)} + \frac{Conc,Cr}{0.1162-(3.72)(PMbase)(CBase,Cr)} \tag{6}$$

The 24-hour PM10 standard (PM10-24 hour) is calculated using the annual PM10 standard, calculated above, and the ratio of NAAQS's 24-hour (150 μg/m3) to annual (50 μg/m3) standards, as shown below:

$$[(150\ \mu g/m3)/(50\ \mu g/m3)]x(PM10,\ \mu g/m3) = \underline{PM10\text{-}24hour} \tag{7}$$

As stated on page 13 of the ROD, metal deposits on the Site are not currently being entrained in the air and therefore, there are no baseline off-Site impacts. Consequently, using the USEPA annual PM10 baseline of 36 μg/m3, baseline arsenic and chromium concentrations of 0 ppm, and contemporaneous arsenic and chromium concentrations of 107 ppm and 165 ppm, respectively, (see Section I), Equation 6 is reduced as follows:

$$\frac{1}{PM10} = \frac{.000107}{0.0537} + \frac{.000165}{0.1162}$$

$$PM10 = 293\ \mu g/m3$$

The 24-hour average is calculated using the annual PM10 standard, calculated above, and the ratio of NAAQS's 24-hour to annual standards, as shown below using Equation 7:

$$[(150\ \mu g/m3)/(50\ \mu g/m3)]x(95\ \mu g/m3) = \underline{879\ \mu g/m3}$$

Based solely on the carcinogenic metals, the annual average PM10 standard for the Site is <u>293 μg/m3</u> and the 24-hour PM10 standard for the Site is <u>879 μg/m3</u>.

<u>III. PM10 Standard Based Solely on Lead:</u>

In the BIF rule, reference air concentrations (RACs)[4] were used by the USEPA to estimate the levels below which would pose negligable health risk for non-carcinogens. The RAC for lead is 9.1×10^{-2} μg/m3. The annual PM10 standard based solely on lead, therefore, is determined using the following equation:

$$(PM10)x(conc,Pb) = 9.1 \times 10^{-2}\ \mu g/m3 \tag{8}$$

Solving for the annual PM10 standard (PM10):

$$(9.1 \times 10^{-2}\ \mu g/m3)/(Conc,Pb) = \underline{PM10} \tag{9}$$

As shown in Section I, the contemporaneous lead concentration in the airborne particulates is assumed to be 608 ppm. Therefore, the annual PM10 standard based solely on lead is:

$$(9.1 \times 10^{-2}\ \mu g/m3)/(.000165) = \underline{150\ \mu g/m3}. \tag{10}$$

The 24-hour average is calculated using the annual PM10 standard, calculated above, and the ratio of NAAQS's 24-hour to annual standards, as shown below:

$$[(150\ \mu g/m3)/(50\ \mu g/m3)]x(150\ \mu g/m3) = \underline{450\ \mu g/m3}.$$

[4]Taken from 54 <u>Federal Register</u> 7232 through 7233, February 21, 1991.

The annual average PM10 standard based solely on lead is 150 $\mu g/m3$ and the 24-hour PM10 standard based solely on lead is 450 $\mu g/m3$.

IV. PM10 Standard Based Solely on Chromium (III):

In the BIF rule, RACs were used by the USEPA to estimate levels below which would pose negligible health risk for non-carcinogens. Chromium III is a non-carcinogen. The RAC for chromium (III) is 1,000 $\mu g/m3$. The annual PM10 standard based solely on chromium (III), therefore, is determined using the following equation:

$$(PM10)x(conc,Cr) = 1{,}000\ \mu g/m3 \tag{11}$$

Solving for the annual PM10 standard (PM10):

$$(1{,}000\ \mu g/m3)/(Conc,Cr) = \underline{PM10} \tag{12}$$

As shown in Section I, the contemporaneous chromium concentration in the airborne particulates is assumed to be 165 ppm. Therefore, the annual PM10 standard based solely on lead is:

$$(1{,}000\ \mu g/m3)/(.000165) = \underline{6.1 \times 10^6\ \mu g/m3}. \tag{13}$$

The 24-hour average is calculated using the annual PM10 standard, calculated above, and the ratio of NAAQS's 24-hour to annual standards, as shown below:

$$[(150\ \mu g/m3)/(50\ \mu g/m3)]x(6.1 \times 10^6\ \mu g/m3) = \underline{1.8 \times 10^7\ \mu g/m3}.$$

The annual average PM10 standard based solely on chromium (III) is $\underline{6.1 \times 10^6\ \mu g/m3}$ and the 24-hour PM10 standard based solely on chromium (III) is $\underline{1.8 \times 10^7\ \mu g/m3}$.

V. PM10 Standard Based on the Health Effects of Solely PM10:

Lippmann[5] reports data which suggest an annual average be within 50 to 65 $\mu g/m3$ based on the health effects of PM10 alone. Again, this is based on a lifetime, 70-year duration. It is necessary, therefore, to ensure that the 70-year PM10 average does not exceed 50 $\mu g/m3$. The 70-year average is computed below:

$$\frac{[(67\ \text{years})\text{x}(\text{PMbase})] + [(3\ \text{years})\text{x}(\text{PM10})]}{70\ \text{years}} = 50\ \mu g/m3 \quad (14)$$

Solving for PM10:

$$\text{PM10} = 1166.7 - 22.33\text{x}(\text{PMbase}) \quad (15)$$

Using the baseline annual PM10 average of 36 $\mu g/m3$, as shown in Section I, the annual PM10 standard would be:

$$\text{PM10} = 1166.7 - 22.33\text{x}(36\ \mu g/m3)$$

$$= \underline{363\ \mu g/m3}$$

The 24-hour average is calculated using the annual PM10 standard, calculated above, and the ratio of NAAQS's 24-hour to annual standards, as shown below:

$$[(150\ \mu g/m3)/(50\ \mu g/m3)]\text{x}(363\ \mu g/m3) = \underline{1089\ \mu g/m3}$$

The 24-hour PM10 standard based on the health effects of solely PM10 is 1089 $\mu g/m3$, and the annual average PM10 standard based on the health effects of solely PM10 is 363 $\mu g/m3$.

VI. Most Restrictive PM10 Standard:

As shown in Sections I through V, the most restrictive PM10 standard is based on lead. An annual average PM10 standard of 150 $\mu g/m3$ and a 24-hour PM10 standard of 450 $\mu g/m3$ ensures that the total risk due to carcinogens does not exceed 10^{-5} and that the reference air concentration for lead is not exceeded.

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[5]Lippmann, Morton, 1989: Health Benefits from Controlling Exposure to Criteria Air Pollutants, Institute of Environmental Medicine, New York University Medical Center.

APPENDIX 4-B

AIR DISPERSION MODELLING

STACK EMISSIONS FROM

PROPOSED ENCLOSED FLARE SYSTEM

TABLE OF CONTENTS

1.0 Summary

This section documents the air dispersion modelling of a proposed stack emission from an enclosed flare system to be located at the Industri-Plex Site in Woburn, Massachusetts. The air dispersion modelling was performed to determine if the "maximum impact" of hydrogen sulfide (H2S) concentrations on the areas around the proposed flare site would meet the one-hour odor air quality standard of 40 ppb.

The study utilized two USEPA developed air dispersion models. The Industrial Source Complex Short Term ("ISCST") model was used to determine the approximate locations of the "maximum impact" assuming a flat terrain. The ISCST results showed the highest impacts at the 100 meter distances from the flare site.

USEPA's Multiple Point Guassian Dispersion Algorithm with Optional Terrain Adjustment (MPTER), commonly referred to as "Complex I", modelled a tighter grid of the higher impacted areas using terrain adjustments. Complex I modelled receptors within 100 meter distances to determine the "maximum impact" location and concentration.

Section 3.0 illustrates the calculations used to estimate the H2S emission rate from the flare (with a 95% DRE) at 0.00005 g/sec. However, the Complex I model will not accept input below 0.01 g/sec for stack emissions. Therefore, a generic emission rate of 0.01 g/sec was modelled for both the ISCST and Complex I models. Accordingly, the results of the "generic" modelling are adjusted in Section 3.0 to represent the calculated H2S emission rate. (The results of the "generic" modelling for both the ISCST and Complex I models are shown in Table 1.)

Tables 2 and 3 list all receptor locations for both models, including grid, fence-line and "nearest neighbor" locations. Table 3 also lists the terrain data of each receptor for the Complex I modelling. A total of 257 receptor locations were modelled to locate/calculate the "maximum impact" and "maximum nearest neighbor impact".

Data from meteorological stations in Boston, MS (surface station) and Portland, ME (upper station) were used to represent wind velocities, wind directions and mixing heights at the site. A five year study was completed using meteorological data from the years of 1970 through 1974. This data was the closest available meteorological data that included all necessary parameters to run the USEPA models. Data from closer meteorological stations are available but lack necessary parameters (i.e., mixing heights) and fall short of the 90% criteria of valid data for key parameters. Using the five year study incorporates 43,824 one-hour data minimizing the relative distances of the meteorological stations to the site.

The maximum impact caused by H2S emissions from the flare, as shown in Section 3.0, is 0.06 ppb. This maximum impact is over 100 times below hydrogen sulfide's odor threshold value (OTV) of 8 ppb and 500 times below the objectionable odor threshold of 40 ppb. Therefore, the inlet/outlet H2S flow could vary (increase) up to 500-fold before the maximum impact exceeds the odor air quality standard established for the site.

The "maximum nearest neighbor impact" is 0.007 ppb. Hence, the maximum nearest neighbor impact caused by H2S emissions from the flare is over 1000 times below the OTV of 8 ppb and 5000 times below objectionable odor threshold. Therefore, the inlet/outlet H2S flow could vary (increase) up to 5000-fold before the maximum nearest neighbor impact exceeds the odor air quality standard established for the site.

If the entire H2S flow to the flare is discharged with no thermal destruction, the maximum impact is calculated to be 1.3 ppb. In other words, the maximum impact for flare emissions during a burnout episode (if blower failed to shut off) would still be below both the OTV and objectionable odor threshold. The maximum nearest neighbor impact during a flare burnout is calculated to be 0.14 ppb; 57 times below the OTV and 285 times below the objectionable odor threshold.

In conclusion, emissions from the flare will not cause H2S concentrations to exceed the one-hour odor air quality standard of 40 ppb.

Table 1: Maximum Impacts (Generic)

Using generic H2S stack emissions of 0.01 g/sec

ISCST MODELLING, ug/m3

	Meteorological Data					
Receptors	1970	1971	1972	1973	1974	Maximum
Fence-line	5.973	6.428	5.979	5.949	5.925	6.428
Neighbor	1.472	1.900	1.634	1.666	1.420	1.900
Grid (1)	6.218	6.176	6.202	8.332	7.267	8.332
Highest	6.218	6.428	6.202	8.332	7.267	8.332

COMPLEX I MODELLING, ug/m3

	Meteorological Data					
Receptors	1970	1971	1972	1973	1974	Maximum
Fence-line	13.62	10.73	13.57	17.19	11.98	17.19
Grid (2)	14.17	10.24	16.13	17.76	10.90	17.76
Highest	14.17	10.73	16.13	17.76	11.98	17.76

Maximum Impact (Generic) is 17.76 ug/m3
Maximum Nearest Neighbor Impact (Generic) is 1.90 ug/m3

NOTES:

(1) ISCST grid receptors were placed at 25m, 50m, 100m, 200m, 300m 400m, 500m, 600m, 700m and 800m at incremental angles of 22.5 degrees.

(2) Complex I grid receptors were placed at 50m and 100m at incremental angles of 10 degrees.

Table 2: Receptor Locations for ISCST Modelling

Grid Receptors (polar coordinates)

Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)
25.0	360/0	50.0	360/0	100.0	360/0	200.0	360/0	300.0	360/0
25.0	22.5	50.0	22.5	100.0	22.5	200.0	22.5	300.0	22.5
25.0	45.0	50.0	45.0	100.0	45.0	200.0	45.0	300.0	45.0
25.0	67.5	50.0	67.5	100.0	67.5	200.0	67.5	300.0	67.5
25.0	90.0	50.0	90.0	100.0	90.0	200.0	90.0	300.0	90.0
25.0	112.5	50.0	112.5	100.0	112.5	200.0	112.5	300.0	112.5
25.0	135.0	50.0	135.0	100.0	135.0	200.0	135.0	300.0	135.0
25.0	157.5	50.0	157.5	100.0	157.5	200.0	157.5	300.0	157.5
25.0	180.0	50.0	180.0	100.0	180.0	200.0	180.0	300.0	180.0
25.0	202.5	50.0	202.5	100.0	202.5	200.0	202.5	300.0	202.5
25.0	225.0	50.0	225.0	100.0	225.0	200.0	225.0	300.0	225.0
25.0	247.5	50.0	247.5	100.0	247.5	200.0	247.5	300.0	247.5
25.0	270.0	50.0	270.0	100.0	270.0	200.0	270.0	300.0	270.0
25.0	292.5	50.0	292.5	100.0	292.5	200.0	292.5	300.0	292.5
25.0	315.0	50.0	315.0	100.0	315.0	200.0	315.0	300.0	315.0
25.0	337.5	50.0	337.5	100.0	337.5	200.0	337.5	300.0	337.5

Grid Receptors – Con't (polar coordinates)

Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)	Distance (meters)	Angle (Degrees)
400.0	360/0	500.0	360/0	600.0	360/0	700.0	360/0	800.0	360/0
400.0	22.5	500.0	22.5	600.0	22.5	700.0	22.5	800.0	22.5
400.0	45.0	500.0	45.0	600.0	45.0	700.0	45.0	800.0	45.0
400.0	67.5	500.0	67.5	600.0	67.5	700.0	67.5	800.0	67.5
400.0	90.0	500.0	90.0	600.0	90.0	700.0	90.0	800.0	90.0
400.0	112.5	500.0	112.5	600.0	112.5	700.0	112.5	800.0	112.5
400.0	135.0	500.0	135.0	600.0	135.0	700.0	135.0	800.0	135.0
400.0	157.5	500.0	157.5	600.0	157.5	700.0	157.5	800.0	157.5
400.0	180.0	500.0	180.0	600.0	180.0	700.0	180.0	800.0	180.0
400.0	202.5	500.0	202.5	600.0	202.5	700.0	202.5	800.0	202.5
400.0	225.0	500.0	225.0	600.0	225.0	700.0	225.0	800.0	225.0
400.0	247.5	500.0	247.5	600.0	247.5	700.0	247.5	800.0	247.5
400.0	270.0	500.0	270.0	600.0	270.0	700.0	270.0	800.0	270.0
400.0	292.5	500.0	292.5	600.0	292.5	700.0	292.5	800.0	292.5
400.0	315.0	500.0	315.0	600.0	315.0	700.0	315.0	800.0	315.0
400.0	337.5	500.0	337.5	600.0	337.5	700.0	337.5	800.0	337.5

Table 2: Receptor Locations for ISCST Modelling (Con't)

Fence–line Receptors (polar coordinates)

Distance (meters)	Angle (Degrees)
41.0	360/0
50.5	22.5
79.1	45.0

Distance (meters)	Angle (Degrees)
62.9	67.5
586.0	90.0
786.0	112.5

Distance (meters)	Angle (Degrees)
772.0	135.0
743.0	157.5
800.0	180.0

Distance (meters)	Angle (Degrees)
829.0	202.5
857.0	225.0
657.0	247.5

Distance (meters)	Angle (Degrees)
329.0	270.0
117.2	292.5
46.7	315.0
40.0	337.5

Nearest Neighbor Receptors (polar coordinates)

Distance (meters)	Angle (Degrees)
1157.0	118.5

Distance (meters)	Angle (Degrees)
1543.0	134.5

Table 3: Receptor Locations for Complex I Modelling

Grid Receptors (polar coordinates)

Distance (meters)	Angle (Degrees)	Elevation (Feet)	Distance (meters)	Angle (Degrees)	Elevation (Feet)
50.0	360/0	113	50.0	180	99
50.0	10.0	115	50.0	190.0	102
50.0	20.0	119	50.0	200.0	108
50.0	30.0	122	50.0	210.0	110
50.0	40.0	125	50.0	220.0	112
50.0	50.0	127	50.0	230.0	113
50.0	60.0	129	50.0	240.0	115
50.0	70.0	128	50.0	250.0	115
50.0	80.0	126	50.0	260.0	113
50.0	90.0	123	50.0	270.0	110
50.0	100.0	121	50.0	280.0	105
50.0	110.0	116	50.0	290.0	103
50.0	120.0	118	50.0	300.0	97
50.0	130.0	117	50.0	310.0	92
50.0	140.0	113	50.0	320.0	96
50.0	150.0	106	50.0	330.0	103
50.0	160.0	108	50.0	340.0	108
50.0	170.0	102	50.0	350.0	111

Grid Receptors – Con't (polar coordinates)

Distance (meters)	Angle (Degrees)	Elevation (Feet)	Distance (meters)	Angle (Degrees)	Elevation (Feet)
100.0	360/0	110	100.0	180.0	84
100.0	10.0	108	100.0	190.0	82
100.0	20.0	113	100.0	200.0	82
100.0	30.0	120	100.0	210.0	82
100.0	40.0	124	100.0	220.0	84
100.0	50.0	128	100.0	230.0	96
100.0	60.0	128	100.0	240.0	108
100.0	70.0	128	100.0	250.0	111
100.0	80.0	127	100.0	260.0	106
100.0	90.0	130	100.0	270.0	98
100.0	100.0	125	100.0	280.0	88
100.0	110.0	120	100.0	290.0	76
100.0	120.0	117	100.0	300.0	76
100.0	130.0	113	100.0	310.0	80
100.0	140.0	111	100.0	320.0	85
100.0	150.0	111	100.0	330.0	87
100.0	160.0	107	100.0	340.0	97
100.0	170.0	88	100.0	350.0	106

Table 3: Receptor Locations for Complex I Modelling (Con't)

Fence-line Receptors (cartesian coordinates)

North (meters)	East (meters)	Elevation (Feet)
46.66	19.33	120
55.93	55.93	126
24.07	58.11	130

North (meters)	East (meters)	Elevation (Feet)
44.85	-108.28	74
33.02	-33.02	94
36.96	-15.31	112
41.00	0.00	116

FIGURES

Figure 1: Site Map

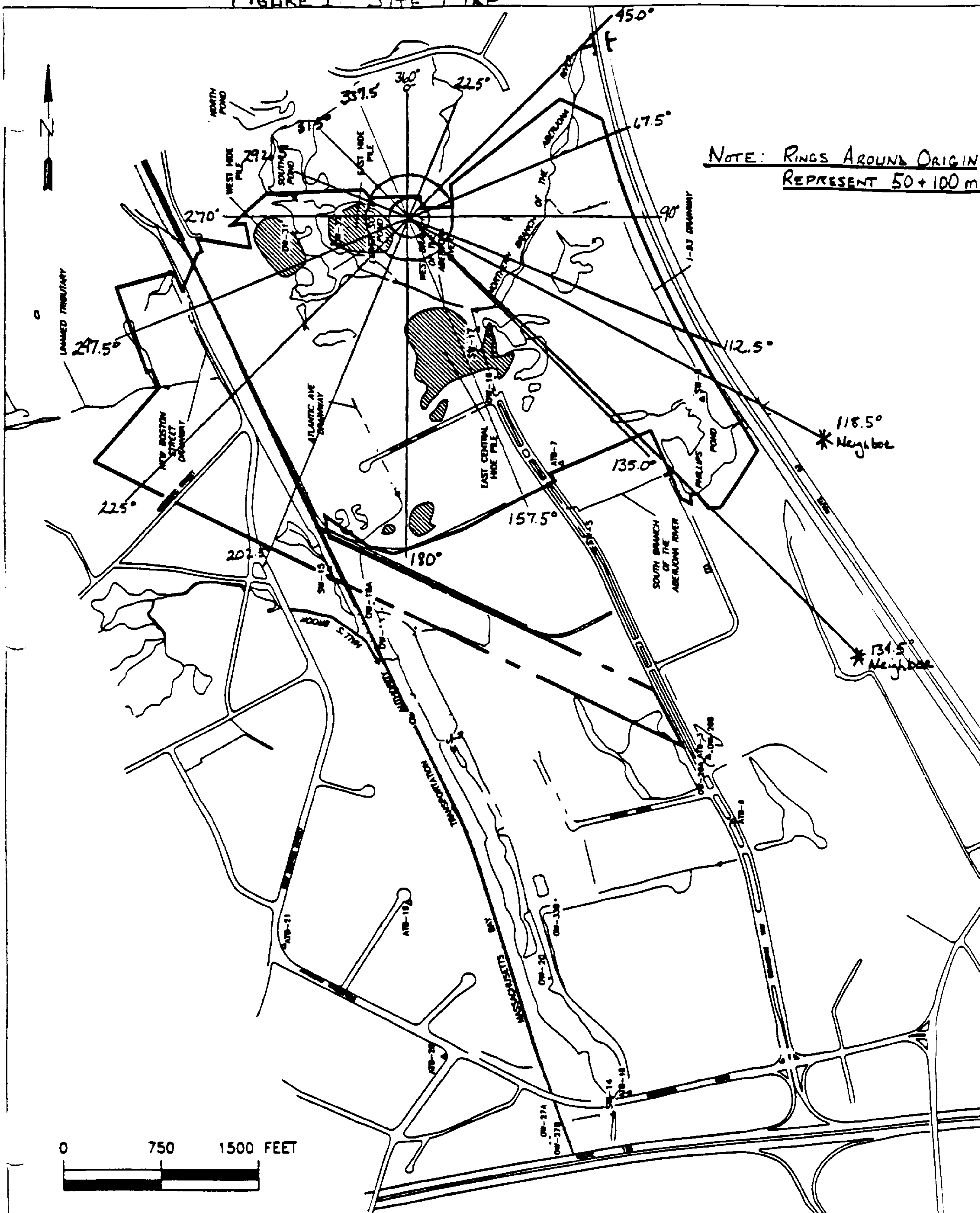
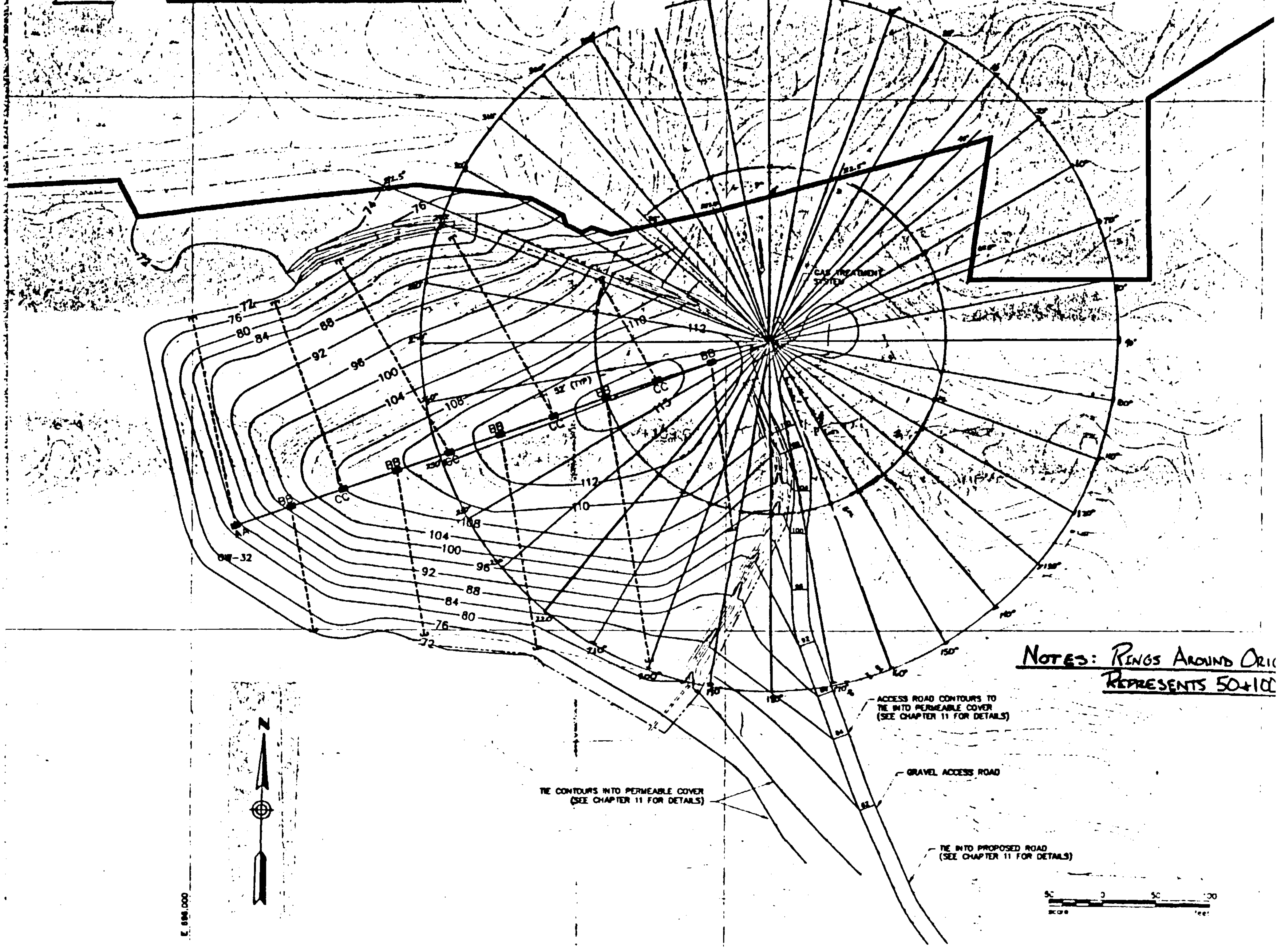


FIGURE 2. TOPOGRAPHICAL MAP



CALCULATIONS

3.0 CALCULATIONS

This section documents the calculations utilized in estimating key parameters used in dispersion models. The calculations are separated into four sections: "Emission Calculations", "Maximum Impact Calculations", "Maximum Nearest Neighbor Impact Calculations", and "Flare Burnout Calculations".

3.1 Emission Calculations

The Pre-Design Investigation, Final Report, April, 1991, reported that total gas flow emitted from the East Hide Pile was 0.5 cfm containing 3000 ppm(v) hydrogen sulfide (H2S). This data was used to calculate the stack emissions from the flare.

Equation 1 converts the H2S concentration from a volume - ppm(v) - to a weight basis - milligrams per cubic meter (mg/m3):

[conc(v),ppm]x[MW/24.45] = conc(wt), mg/m3; where
MW equals the molecular weight

[3000 ppm]x[34.07/24.45] = 4180 mg/m3 (1)

Converting from mg/m3 to grams per cubic foot (g/ft3) is performed in Equation 2.

[mg/m3]x[(1 m3)/(35.32 ft3)]x[(1 g)/(1000 mg)] = g/ft3

[4180 mg/m3]x(1 m3/35.32 ft3]x[1 g/1000 mg] = 0.118 g/ft3 (2)

Using the East Hide Pile flow of 0.5 cfm, a H2S inlet flow is calculated below:

[g/ft3]x[0.5 ft3/min]x[(1 min)/(60 sec)] = g/sec (Inlet)

[.118 g/ft3]x[.5 ft3/min]x[1 min/60 sec] = 0.001 g/sec (Inlet) (3)

The outlet stack emission of H2S is calculated by using the flare's 95% DRE in Equation 4.

[g/sec (Inlet)] x [1 - DRE] = g/sec (Outlet)

[0.001 g/sec (Inlet)]x[1-.95] = 0.00005 g/sec (Outlet) (4)

Therefore, the calculated stack emission of H2S is 0.00005 g/sec.

3.2 Maximum Impact Calculations

Since the H2S emissions (0.00005 g/sec) were too small for Complex I modelling[1], a generic H2S emission of 0.01 g/sec was modelled for both Complex I and ISCST models. The generic modelling resulted in the "maximum impact (generic)" of 17.76 μg/m3, as shown in Table 1. The maximum impact (generic) is converted to ppb(v) below:

[conc(wt), μg/m3]x[24.45/MW] = conc(v), ppb

[17.76 μg/m3]x[24.45/34.07] = 12.75 ppb (5)

The maximum impact (generic) is directly proportional to the modelled emissions. Accordingly, the maximum impact is adjusted to represent the calculated emission for the flare (from Equation 4).

[generic impact, ppb]x[(flare emission)/(generic emission)]= flare impact,ppb

[12.75 ppb] x [(0.00005 g/sec)/(0.01 g/sec)] = 0.06 ppb Maximum Impact (6)

The maximum impact caused by H2S emissions from the flare is over 100 times below the OTV of 8 ppb and 500 times below objectionable odor threshold of 40 ppb. Therefore, the inlet/outlet H2S flow could vary (increase) up to 500-fold before the maximum impact exceeds the objectionable odor threshold.

3.3 Maximum Nearest Neighbor Impact Calculations

The "Maximum Nearest Neighbor Impact" is the highest H2S concentration at any "Nearest Neighbor" receptor. The "generic" maximum nearest neighbor impact, modelling 0.01 g/sec, was 1.90 μg/m3 at the 118.5° receptor (see site map for specific location). The generic impact is converted to represent the calculated emissions of 0.00005 g/sec (from Equation 4) using Equations 5 and 6.

[1.90 μg/m3]x[24.45/34.07] = 1.36 ppb (generic impact) (7)

[1.36 ppb]x[(0.00005 g/sec)/(0.01 g/sec)]=0.007 ppb Max Nearest Neighbor (8)

The maximum nearest neighbor impact caused by H2S emissions from the flare is over 1000 times below the OTV of 8 ppb and 5000 times below objectionable odor threshold. Therefore, the inlet/outlet H2S flow could vary (increase) up to 5000-fold before the maximum nearest neighbor impact exceeds the objectionable odor threshold.

---

[1] Complex I will not accept input below 0.01 g/sec for stack emissions.

3.4 Flare Burnout Calculation

If the entire H_2S flow to the flare is discharged with no thermal destruction, the following maximum impact is calculated using Equation 6 with a H_2S emission rate of 0.001 g/sec (from Equation 3).

$$[12.75 \text{ ppb}] \times [(0.001 \text{ g/sec})/(0.01 \text{ g/sec})] = \underline{1.3 \text{ ppb}} \qquad (9)$$

In other words, the dispersion models show that the maximum impact for flare emissions during burnout (if blower failed to shut off) would still be below the both the OTV and objectionable odor threshold.

The maximum nearest neighbor impact during a flare burnout is calculated using Equation 9 with a H_2S emission rate of 0.001 g/sec.

$$[1.36 \text{ ppb}] \times [(0.001 \text{ g/sec})/(0.01 \text{ g/sec})] = \underline{0.14 \text{ ppb}} \qquad (10)$$

The dispersion models show that the maximum nearest neighbor impact for flare emissions during burnout (if blower failed to shut off) would be 57 times below the OTV and 285 times below the objectionable odor threshold.

INPUT FILES

4.0 Input Files

Attached to this section are the input files for the ISCST and Complex I models, respectively. Both input files utilize the same input data with the exception of receptor locations and terrain/elevation data. The following data are included in the input files:

- Gas Flowrate = 150 cfm (includes make-up air)[2]
- Stack Height = 10 meters
- Stack Diameter = 0.46 meters
- Exit Velocity = 0.43 meters/second (Calculated using flowrate and stack diameter).

Section 3.0 illustrates the calculations used to estimate the H2S emission rate at 0.00005 g/sec. However, the Complex I model will not accept input below 0.01 g/sec for stack emissions. The input files, therefore, have 0.01 g/sec emission rates for both the ISCST and Complex I models. Therefore, the results of the "generic" modelling are adjusted in Section 3.0 to represent the calculated H2S emission rate.

Tables 2 and 3 in Section 1.0 list all receptor locations for both models. A total of 257 receptor locations were modelled to locate the "maximum impact" and "maximum nearest neighbor impact". Along with fence-line and nearest neighbor receptors, grid receptors for the ISCST model were placed at 25m, 50m, 100m, 200m, 300m, 400m, 500m, 600m, 700m, 800m at incremental angles of 22.5°. Complex I grid receptors tighten the grid at 50m and 100m with incremental angles of 10°.

A flat terrain was assumed for the ISCST model. Complex I used terrain elevations taken from "East Hide Pile Gas Collection System Piping Plan", Sheet 15-1, Golder Associates. Table 3 in Section 1.0 lists the receptor elevations used in Complex I input file. The flare's base elevation was 108 feet above sea level.

---

[2] Flowrate taken from the "95% Design Report" of the East Hide Pile Gas Collection System, Golder Associates.

```
WOBURN - EAST HIDE PILE - CASE #1                                  .000      .000 0 0 0 0 0 0 0
 1 2 2 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0
000001 00010     16     18     0      0      0      0
    25.00     50.00    100.00    200.00    300.00    400.00     500.0     600.0
   700.00     800.0
    360.0      22.5      45.0      67.5      90.0     112.5     135.0     157.5
    180.0     202.5     225.0     247.5     270.0     292.5     315.0     337.5
     41.0     360.0
     50.5      22.5
     79.1      45.0
     62.9      67.5
    586.0      90.0
    786.0     112.5
    772.0     135.0
    743.0     157.5
    800.0     180.0
    829.0     202.5
    857.0     225.0
    657.0     247.5
    329.0     270.0
    117.2     292.5
     46.7     315.0
     40.0     337.5
   1157.0     118.5
   1543.0     134.5
   10.000     1.540     3.090     5.140     8.230    10.800
.100E+07.0000000(GRAMS/SEC) (MICROGRAMS PER CUBIC METER) 9 3
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111111111111111111111111111111111111
 14739    70 14764    70
    100 00.0100000.000000.000000.0000010.000999.000.4300.460000.00000.00000.0000
```

```
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1
70 1 1 8760 1 3 1 0 0.001 0.3048 0
1 0 1 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 1 0 0
10 0.07 0.07 0.10 0.15 0.35 0.55 0.5 0.5 0.5 0.5 0.0 0.0 10
FLARE STACK      0.0     0.0    0.01     0.0    10.0    999.     0.46     0.43108.
ENDPOINTS
14739 70 14764 70
0050010000000000000       0.0      0.0
01             115.0    108.0
02             119.0    113.0
03             122.0    120.0
04             125.0    124.0
05             127.0    128.0
06             129.0    128.0
07             128.0    128.0
08             126.0    127.0
09             123.0    130.0
10             121.0    125.0
11             116.0    120.0
12             118.0    117.0
13             117.0    113.0
14             113.0    111.0
15             106.0    111.0
16             108.0    107.0
17             102.0     88.0
18              99.0     84.0
19             102.0     82.0
20             108.0     82.0
21             110.0     82.0
22             112.0     84.0
23             113.0     96.0
24             115.0    108.0
25             115.0    111.0
26             113.0    106.0
27             110.0     98.0
28             105.0     88.0
29             103.0     76.0
30              97.0     76.0
31              92.0     80.0
32              96.0     85.0
33             103.0     87.0
34             108.0     97.0
35             111.0    106.0
36             113.0    110.0
FENC22.5     19.33    46.66       0.0     120.0
FENC45.0     55.93    55.93       0.0     126.0
FENC67.5     58.11    24.07       0.0     130.0
FEN292.5   -108.28    44.85       0.0      74.0
FEN315.0    -33.02    33.02       0.0      94.0
FEN337.5    -15.31    36.96       0.0     112.0
FEN360.0      0.0     41.00       0.0     116.0
ENDREC
```

ISCST - 1970

```
                    ISCST              (DATED 88348)

1 2 2 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
   1     10     16     18      0      0      0      0
  0.25000E+02   0.50000E+02   0.10000E+03   0.20000E+03   0.30000E+03   0.40000E+03   0.50000E+03   0.60000E+03
  0.70000E+03   0.80000E+03
  0.36000E+03   0.22500E+02   0.45000E+02   0.67500E+02   0.90000E+02   0.11250E+03   0.13500E+03   0.15750E+03
  0.18000E+03   0.20250E+03   0.22500E+03   0.24750E+03   0.27000E+03   0.29250E+03   0.31500E+03   0.33750E+03
  0.41000E+02   0.36000E+03
  0.50500E+02   0.22500E+02
  0.79100E+02   0.45000E+02
  0.62900E+02   0.67500E+02
  0.58600E+03   0.90000E+02
  0.78600E+03   0.11250E+03
  0.77200E+03   0.13500E+03
  0.74300E+03   0.15750E+03
  0.80000E+03   0.18000E+03
  0.82900E+03   0.20250E+03
  0.85700E+03   0.22500E+03
  0.65700E+03   0.24750E+03
  0.32900E+03   0.27000E+03
  0.11720E+03   0.29250E+03
  0.46700E+02   0.31500E+03
  0.40000E+02   0.33750E+03
  0.11570E+04   0.11850E+03
  0.15430E+04   0.13450E+03
  0.10000E+02   0.15400E+01   0.30900E+01   0.51400E+01   0.82300E+01   0.10800E+02
  0.10000E+07   0.00000E+00(GRAMS/SEC) (MICROGRAMS PER CUBIC METER) 9 3
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111111111111111111111111111111111111
14739    70 14764    70
  1 0 0 0 0  1.000E-2  0.000E+0  0.000E+0  0.000E+0  1.000E+1  9.990E+2  4.300E-1  4.600E-1  0.000E+0  0.000E+0  0.000E+0
```

```
          *** WOBURN - EAST HIDE PILE - CASE #1                        ***

CALCULATE (CONCENTRATION=1,DEPOSITION=2)                          ISW(1) =   1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)           ISW(2) =   2
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                  ISW(3) =   2
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                          ISW(4) =   0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                     ISW(5) =   0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                  ISW(6) =   1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:
  HOURLY (YES=1,NO=0)                                             ISW(7) =   1
  2-HOUR (YES=1,NO=0)                                             ISW(8) =   0
  3-HOUR (YES=1,NO=0)                                             ISW(9) =   0
  4-HOUR (YES=1,NO=0)                                            ISW(10) =   0
  6-HOUR (YES=1,NO=0)                                            ISW(11) =   0
  8-HOUR (YES=1,NO=0)                                            ISW(12) =   0
  12-HOUR (YES=1,NO=0)                                           ISW(13) =   0
  24-HOUR (YES=1,NO=0)                                           ISW(14) =   0
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                              ISW(15) =   0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):
  DAILY TABLES (YES=1,NO=0)                                      ISW(16) =   0
  HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                   ISW(17) =   1
  MAXIMUM 50 TABLES (YES=1,NO=0)                                 ISW(18) =   0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)        ISW(19) =   1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3) ISW(20) =  0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)        ISW(21) =   1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3) ISW(22) =   1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                ISW(23) =   0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)            ISW(24) =   1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)      ISW(25) =   2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)            ISW(26) =   1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)          ISW(27) =   1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                          ISW(28) =   1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                 ISW(29) =   1
DEBUG OPTION CHOSEN (YES=1,NO=2)                                 ISW(30) =   1
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)              ISW(31) =   0

NUMBER OF INPUT SOURCES                                           NSOURC =   1
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                          NGROUP =   0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)              IPERD =   0
NUMBER OF X (RANGE) GRID VALUES                                   NXPNTS =  10
NUMBER OF Y (THETA) GRID VALUES                                   NYPNTS =  16
NUMBER OF DISCRETE RECEPTORS                                      NXWYPT =  18
SOURCE EMISSION RATE UNITS CONVERSION FACTOR                          TK =.10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                  ZR =  10.00  METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                          IMET =   9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION               DECAY =0.000000E+00
SURFACE STATION NO.                                                  ISS = 14739
YEAR OF SURFACE DATA                                                 ISY = 70
UPPER AIR STATION NO.                                                IUS = 14764
YEAR OF UPPER AIR DATA                                               IUY = 70
ALLOCATED DATA STORAGE                                             LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                         MIMIT =  1595 WORDS
```

*** WOBURN - EAST HIDE PILE - CASE #1 ***

*** METEOROLOGICAL DAYS TO BE PROCESSED ***
(IF=1)

```
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1
```

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

```
*** WOBURN - EAST HIDE PILE - CASE #1                                  ***


                         *** RANGES OF POLAR GRID SYSTEM ***
                                      (METERS)

   25.0,      50.0,     100.0,     200.0,     300.0,     400.0,     500.0,     600.0,     700.0,     800.0,


                        *** RADIAL ANGLES OF POLAR GRID SYSTEM ***

                                      (DEGREES)

  360.0,      22.5,      45.0,      67.5,      90.0,     112.5,     135.0,     157.5,     180.0,     202.5,
  225.0,     247.5,     270.0,     292.5,     315.0,     337.5,

                  *** RANGE,THETA COORDINATES OF DISCRETE RECEPTORS ***
                                  (METERS,DEGREES)

(     41.0,     360.0), (     50.5,      22.5), (     79.1,      45.0), (     62.9,      67.5), (    586.0,      90.0),
(    786.0,     112.5), (    772.0,     135.0), (    743.0,     157.5), (    800.0,     180.0), (    829.0,     202.5),
(    857.0,     225.0), (    657.0,     247.5), (    329.0,     270.0), (    117.2,     292.5), (     46.7,     315.0),
(     40.0,     337.5), (   1157.0,     118.5), (   1543.0,     134.5), (
```

```
*** WOBURN - EAST HIDE PILE - CASE #1                                    ***

                                    *** SOURCE DATA ***

                 EMISSION RATE                                          TEMP.     EXIT VEL.
                    TYPE=0,1                                            TYPE=0     TYPE=0
       T W       (GRAMS/SEC)                                            (DEG.K);  (M/SEC);             BLDG.     BLDG.     BLDG.
       Y A NUMBER   TYPE=2                            BASE              VERT.DIM  HORZ.DIM DIAMETER   HEIGHT    LENGTH    WIDTH
SOURCE P K  PART.  (GRAMS/SEC)      X         Y       ELEV.    HEIGHT    TYPE=1   TYPE=1,2  TYPE=0    TYPE=0    TYPE=0    TYPE=0
NUMBER E E  CATS. *PER METER**2 (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS) (METERS) (METERS) (METERS)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

    1  0 0    0  0.10000E-01      0.0       0.0      0.0     10.00    999.00       0.43     0.46      0.00      0.00      0.00
* CALM HOURS (=1) FOR DAY   3 *  0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  12 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  17 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0
* CALM HOURS (=1) FOR DAY  20 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
* CALM HOURS (=1) FOR DAY  25 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  28 *  0 1 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  34 *  0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  36 *  0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
* CALM HOURS (=1) FOR DAY  37 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1
* CALM HOURS (=1) FOR DAY  38 *  0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  39 *  0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
* CALM HOURS (=1) FOR DAY  48 *  0 0 0 0 0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  49 *  0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  56 *  0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  57 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY  58 *  0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  73 *  0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  77 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY  78 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  79 *  0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  85 *  0 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  90 *  0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  97 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0
* CALM HOURS (=1) FOR DAY 104 *  0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 105 *  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 114 *  0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 116 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
* CALM HOURS (=1) FOR DAY 124 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0
* CALM HOURS (=1) FOR DAY 130 *  0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 132 *  1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 133 *  0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 134 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0
* CALM HOURS (=1) FOR DAY 138 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 140 *  0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0
* CALM HOURS (=1) FOR DAY 157 *  1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 158 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
* CALM HOURS (=1) FOR DAY 173 *  0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 174 *  0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 176 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
* CALM HOURS (=1) FOR DAY 219 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 220 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
* CALM HOURS (=1) FOR DAY 221 *  0 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 222 *  1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 246 *  0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 255 *  0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 258 *  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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* CALM HOURS (=1) FOR DAY 267 *	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 273 *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
* CALM HOURS (=1) FOR DAY 275 *	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 280 *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 281 *	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 282 *	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 284 *	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 285 *	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 301 *	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0
* CALM HOURS (=1) FOR DAY 305 *	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 306 *	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
* CALM HOURS (=1) FOR DAY 334 *	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.21767 AND OCCURRED AT (100.0, 45.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.58318 (165,11)	4.11894 (165,11)	6.13645 (79, 9)	4.92219 (157, 2)	4.02106 (157, 2)
315.0 /	0.72980 (159,12)	3.87627 (159,12)	5.57176 (140,18)	5.59534 (140,18)	4.33540 (37,12)
292.5 /	0.53962 (159,13)	4.13923 (140,11)	5.69587 (131,18)	5.26525 (332,11)	5.13177 (332,11)
270.0 /	0.56905 (130,12)	3.34433 (130,13)	5.07912 (38,12)	5.43604 (137, 3)	5.10980 (178,13)
247.5 /	0.15014 (217,12)	3.34593 (234,10)	5.36496 (12,11)	5.48724 (12,11)	4.47259 (282,18)
225.0 /	0.18135 (140,12)	4.22192 (140,12)	6.10631 (28,11)	5.84369 (139,24)	5.66693 (139,24)
202.5 /	0.13162 (194, 9)	3.24712 (78,11)	5.18955 (255, 8)	5.42873 (116, 6)	4.46798 (116, 6)
180.0 /	0.11656 (278,12)	3.36228 (179, 8)	6.07383 (12,10)	4.63101 (138,19)	3.52996 (138,19)
157.5 /	0.42261 (174,11)	4.50010 (174,11)	5.96739 (133, 9)	5.61621 (8,17)	5.47582 (8,17)
135.0 /	0.28503 (152,12)	3.22209 (148, 9)	5.10592 (148, 9)	5.23354 (343,16)	5.06739 (343,16)
112.5 /	0.70982 (152,12)	3.77908 (152,12)	5.03342 (359,14)	5.43039 (140, 6)	4.46868 (140, 6)
90.0 /	0.12884 (237, 9)	3.28066 (147,14)	5.54217 (330,10)	4.59780 (23,20)	3.51717 (23,20)
67.5 /	0.66816 (161,10)	4.62895 (159,10)	6.12947 (229,15)	4.61666 (17,17)	3.70350 (165, 6)
45.0 /	0.37695 (161,10)	3.13048 (36,10)	6.21767 (286,12)	5.29244 (125, 6)	4.34976 (125, 6)
22.5 /	0.60923 (152,13)	4.21812 (152,13)	5.62169 (56, 9)	4.60118 (359,16)	3.52370 (169, 4)
360.0 /	0.61631 (150,10)	4.30420 (150,10)	5.82458 (130, 9)	5.67670 (334, 7)	5.50665 (334, 7)

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.21767 AND OCCURRED AT (100.0, 45.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	2.95557 (157, 2)	2.21172 (157, 2)	1.70590 (157, 2)	1.55761 (62,20)	1.67447 (62,20)
315.0 /	3.20408 (37,12)	2.40732 (37,12)	1.86275 (37,12)	1.52563 (221,23)	1.64856 (221,23)
292.5 /	4.03829 (332,11)	3.13171 (332,11)	2.46727 (332,11)	1.98474 (332,11)	1.67678 (37,20)
270.0 /	3.99862 (178,13)	3.09183 (178,13)	2.43158 (178,13)	1.95379 (178,13)	1.60200 (178,13)
247.5 /	3.47348 (138,17)	2.67267 (138,17)	2.13306 (78, 6)	1.82861 (78, 6)	1.60787 (78, 6)
225.0 /	4.46179 (139,24)	3.46638 (139,24)	2.73691 (139,24)	2.20661 (139,24)	1.87519 (278,22)
202.5 /	3.46494 (332, 2)	2.66805 (332, 2)	2.09020 (332, 2)	1.67352 (332, 2)	1.40525 (58, 3)
180.0 /	2.53279 (138,19)	1.87404 (138,19)	1.43704 (138,19)	1.57579 (38, 5)	1.69583 (38, 5)
157.5 /	4.31784 (8,17)	3.35594 (8,17)	2.64963 (8,17)	2.13576 (8,17)	1.75591 (8,17)
135.0 /	3.97734 (343,16)	3.08024 (343,16)	2.42475 (343,16)	1.94950 (343,16)	1.59915 (343,16)
112.5 /	3.30231 (140, 6)	2.48198 (140, 6)	1.92146 (140, 6)	1.55811 (78,23)	1.67921 (78,23)
90.0 /	2.56829 (126, 4)	2.08335 (123, 6)	1.76138 (123, 6)	1.53251 (273,23)	1.65089 (273,23)
67.5 /	2.85612 (165, 6)	2.18143 (165, 6)	1.69740 (165, 6)	1.40937 (118, 5)	1.37464 (158,22)
45.0 /	3.21081 (125, 6)	2.41086 (125, 6)	1.86479 (125, 6)	1.51654 (38,22)	1.57946 (38,22)
22.5 /	2.57252 (169, 4)	1.91456 (169, 4)	1.48399 (39, 8)	1.73028 (158,21)	1.87034 (158,21)
360.0 /	4.33338 (334, 7)	3.36443 (334, 7)	2.65465 (334, 7)	2.13892 (334, 7)	1.85727 (159,22)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	3.56418	(150,10)	50.5	22.5	4.23657	(152,13)
79.1	45.0	5.93974	(286,12)	62.9	67.5	4.99604	(159,10)
586.0	90.0	1.80008	(123, 6)	786.0	112.5	1.66673	(78,23)
772.0	135.0	1.68717	(343,16)	743.0	157.5	1.95877	(8,17)
800.0	180.0	1.69583	(38, 5)	829.0	202.5	1.40969	(58, 3)
857.0	225.0	1.92027	(278,22)	657.0	247.5	1.94665	(78, 6)
329.0	270.0	4.78535	(178,13)	117.2	292.5	5.97298	(131,18)
46.7	315.0	3.77415	(159,12)	40.0	337.5	3.27656	(165,11)
1157.0	118.5	1.47202	(38, 1)	1543.0	134.5	1.22010	(330, 3)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 5.74744 AND OCCURRED AT (100.0, 180.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.51457 (227,11)	3.53424 (130,11)	4.93256 (303,11)	4.32526 (307,24)	3.51209 (307,24)
315.0 /	0.70050 (165,13)	3.86750 (130,11)	5.47117 (221, 7)	5.25824 (37,12)	3.67952 (37,14)
292.5 /	0.50807 (130,12)	3.28011 (206, 9)	5.18174 (286,14)	4.74283 (120, 6)	3.70904 (180, 6)
270.0 /	0.25826 (140,11)	3.20762 (130,12)	4.76948 (36,15)	5.31753 (178,13)	4.47105 (137, 3)
247.5 /	0.14294 (149,10)	3.20950 (222, 8)	5.05731 (222, 8)	5.43970 (282,18)	4.46388 (138,17)
225.0 /	0.11674 (234, 9)	3.11785 (89,12)	5.58851 (124, 7)	4.92220 (284, 4)	4.02106 (284, 4)
202.5 /	0.11800 (139,12)	3.08045 (144, 9)	4.64956 (174, 9)	5.26018 (49, 3)	4.44676 (332, 2)
180.0 /	0.09054 (60,12)	3.12401 (38,11)	5.74744 (20,12)	4.27575 (78, 7)	3.25119 (78, 7)
157.5 /	0.13220 (236,13)	3.25205 (148, 8)	5.22380 (8,16)	5.31804 (8,16)	4.01629 (140, 3)
135.0 /	0.20055 (174,11)	3.01985 (20,11)	4.89517 (20,11)	4.72467 (73, 4)	3.61604 (73, 4)
112.5 /	0.14136 (171,12)	2.71677 (188, 9)	4.39245 (103, 7)	4.91073 (140, 5)	4.01629 (140, 5)
90.0 /	0.11526 (131,13)	3.23077 (214, 9)	5.14400 (210, 8)	4.33132 (126, 4)	3.51458 (126, 4)
67.5 /	0.61604 (165,12)	4.28943 (165,12)	5.28560 (3,13)	4.34141 (259, 6)	3.69365 (332,12)
45.0 /	0.23734 (152,13)	3.08752 (160, 9)	5.64865 (273, 9)	5.27983 (42, 3)	4.34447 (42, 3)
22.5 /	0.30268 (159,11)	3.53093 (159,11)	5.08768 (91,14)	4.35338 (169, 4)	3.51848 (359,16)
360.0 /	0.60122 (188,12)	3.86390 (159,11)	5.55606 (36, 9)	5.50211 (66, 8)	4.48018 (160, 5)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 5.74744 AND OCCURRED AT (100.0, 180.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	2.56714 (307,24)	1.91176 (307,24)	1.46824 (307,24)	1.35354 (157, 2)	1.26675 (136, 4)
315.0 /	2.84425 (37,14)	2.17506 (37,14)	1.69369 (37,14)	1.49398 (251,22)	1.55911 (251,22)
292.5 /	2.85885 (180, 6)	2.18290 (180, 6)	1.82081 (85, 7)	1.57707 (85, 7)	1.62871 (332,11)
270.0 /	3.30342 (137, 3)	2.48256 (137, 3)	1.92179 (137, 3)	1.52974 (137, 3)	1.24704 (137, 3)
247.5 /	3.46623 (34,12)	2.66874 (34,12)	2.09291 (138,17)	1.67522 (138,17)	1.36880 (138,17)
225.0 /	2.95558 (284, 4)	2.21173 (284, 4)	1.70590 (284, 4)	1.73543 (278,22)	1.81475 (139,24)
202.5 /	3.30198 (116, 6)	2.48180 (116, 6)	1.92136 (116, 6)	1.52947 (116, 6)	1.37531 (129,24)
180.0 /	2.32601 (78, 7)	1.71644 (78, 7)	1.32139 (329,19)	1.51878 (329,19)	1.58147 (329,19)
157.5 /	2.95335 (140, 3)	2.21056 (140, 3)	1.70523 (140, 3)	1.51383 (220,23)	1.63328 (220,23)
135.0 /	2.60024 (73, 4)	1.92687 (73, 4)	1.47930 (73, 4)	1.34519 (330, 3)	1.39596 (330, 3)
112.5 /	2.95335 (140, 5)	2.21055 (140, 5)	1.70523 (140, 5)	1.52953 (140, 6)	1.24690 (140, 6)
90.0 /	2.55673 (123, 6)	1.91235 (126, 4)	1.46858 (126, 4)	1.52845 (123, 6)	1.35188 (123, 6)
67.5 /	2.85125 (332,12)	2.17881 (332,12)	1.69589 (332,12)	1.35106 (165, 6)	1.34046 (164,23)
45.0 /	3.20833 (42, 3)	2.40956 (42, 3)	1.86404 (42, 3)	1.48329 (125, 6)	1.20837 (125, 6)
22.5 /	2.56339 (39, 8)	1.91428 (39, 8)	1.46985 (169, 4)	1.56007 (38,23)	1.67677 (38,23)
360.0 /	3.34408 (160, 5)	2.59566 (160, 5)	2.11895 (160, 5)	1.80113 (160, 5)	1.75801 (334, 7)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	2.92102	(159,11)	50.5	22.5	3.56076	(159,11)
79.1	45.0	5.38599	(36,10)	62.9	67.5	4.77243	(161, 8)
586.0	90.0	1.52111	(126, 4)	786.0	112.5	1.28143	(140, 6)
772.0	135.0	1.38754	(330, 3)	743.0	157.5	1.57443	(220,23)
800.0	180.0	1.58147	(329,19)	829.0	202.5	1.38082	(129,24)
857.0	225.0	1.63641	(139,24)	657.0	247.5	1.83862	(138,17)
329.0	270.0	4.09806	(137, 3)	117.2	292.5	5.18974	(286,14)
46.7	315.0	3.66321	(165,13)	40.0	337.5	2.52286	(130,11)
1157.0	118.5	1.28104	(302, 1)	1543.0	134.5	0.80587	(220, 4)

ISCST - 1971

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              ISCST            (DATED 88348)

1 2 2 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
   1    10    16    18     0     0     0     0
  0.25000E+02  0.50000E+02  0.10000E+03  0.20000E+03  0.30000E+03  0.40000E+03  0.50000E+03  0.60000E+03
  0.70000E+03  0.80000E+03
  0.36000E+03  0.22500E+02  0.45000E+02  0.67500E+02  0.90000E+02  0.11250E+03  0.13500E+03  0.15750E+03
  0.18000E+03  0.20250E+03  0.22500E+03  0.24750E+03  0.27000E+03  0.29250E+03  0.31500E+03  0.33750E+03
  0.41000E+02  0.36000E+03
  0.50500E+02  0.22500E+02
  0.79100E+02  0.45000E+02
  0.62900E+02  0.67500E+02
  0.58600E+03  0.90000E+02
  0.78600E+03  0.11250E+03
  0.77200E+03  0.13500E+03
  0.74300E+03  0.15750E+03
  0.80000E+03  0.18000E+03
  0.82900E+03  0.20250E+03
  0.85700E+03  0.22500E+03
  0.65700E+03  0.24750E+03
  0.32900E+03  0.27000E+03
  0.11720E+03  0.29250E+03
  0.46700E+02  0.31500E+03
  0.40000E+02  0.33750E+03
  0.11570E+04  0.11850E+03
  0.15430E+04  0.13450E+03
  0.10000E+02  0.15400E+01  0.30900E+01  0.51400E+01  0.82300E+01  0.10800E+02
  0.10000E+07  0.00000E+00(GRAMS/SEC) (MICROGRAMS PER CUBIC METER) 9 3
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14739    71 14764    71
  1 0 0 0 0  1.000E-2  0.000E+0  0.000E+0  0.000E+0  1.000E+1  9.990E+2  4.300E-1  4.600E-1  0.000E+0  0.000E+0  0.000E+0
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              *** WOBURN - EAST HIDE PILE - CASE #1                              ***

CALCULATE (CONCENTRATION=1,DEPOSITION=2)                               ISW(1) =    1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)                ISW(2) =    2
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                       ISW(3) =    2
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                               ISW(4) =    0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                          ISW(5) =    0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                       ISW(6) =    1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:
  HOURLY (YES=1,NO=0)                                                  ISW(7) =    1
  2-HOUR (YES=1,NO=0)                                                  ISW(8) =    0
  3-HOUR (YES=1,NO=0)                                                  ISW(9) =    0
  4-HOUR (YES=1,NO=0)                                                 ISW(10) =    0
  6-HOUR (YES=1,NO=0)                                                 ISW(11) =    0
  8-HOUR (YES=1,NO=0)                                                 ISW(12) =    0
  12-HOUR (YES=1,NO=0)                                                ISW(13) =    0
  24-HOUR (YES=1,NO=0)                                                ISW(14) =    0
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                                   ISW(15) =    0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):
  DAILY TABLES (YES=1,NO=0)                                           ISW(16) =    0
  HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                        ISW(17) =    1
  MAXIMUM 50 TABLES (YES=1,NO=0)                                      ISW(18) =    0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)             ISW(19) =    1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)     ISW(20) =    0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)             ISW(21) =    1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)      ISW(22) =    1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                     ISW(23) =    0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)                 ISW(24) =    1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)           ISW(25) =    2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)                 ISW(26) =    1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)               ISW(27) =    1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                               ISW(28) =    1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                      ISW(29) =    1
DEBUG OPTION CHOSEN (YES=1,NO=2)                                      ISW(30) =    1
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)                   ISW(31) =    0

NUMBER OF INPUT SOURCES                                                NSOURC =    1
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                               NGROUP =    0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)                   IPERD =    0
NUMBER OF X (RANGE) GRID VALUES                                        NXPNTS =   10
NUMBER OF Y (THETA) GRID VALUES                                        NYPNTS =   16
NUMBER OF DISCRETE RECEPTORS                                           NXWYPT =   18
SOURCE EMISSION RATE UNITS CONVERSION FACTOR                               TK =.10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                       ZR =   10.00  METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                               IMET =    9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION                    DECAY =0.000000E+00
SURFACE STATION NO.                                                       ISS = 14739
YEAR OF SURFACE DATA                                                      ISY = 71
UPPER AIR STATION NO.                                                     IUS = 14764
YEAR OF UPPER AIR DATA                                                    IUY = 71
ALLOCATED DATA STORAGE                                                  LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                              MIMIT =  1595 WORDS
```

*** WOBURN - EAST HIDE PILE - CASE #1 ***

*** METEOROLOGICAL DAYS TO BE PROCESSED ***
(IF=1)

```
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1
```

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

*** RANGES OF POLAR GRID SYSTEM ***
(METERS)

```
25.0,  50.0,  100.0,  200.0,  300.0,  400.0,  500.0,  600.0,  700.0,  800.0,
```

*** RADIAL ANGLES OF POLAR GRID SYSTEM ***

(DEGREES)

```
360.0,   22.5,   45.0,   67.5,   90.0,  112.5,  135.0,  157.5,  180.0,  202.5,
225.0,  247.5,  270.0,  292.5,  315.0,  337.5,
```

*** RANGE,THETA COORDINATES OF DISCRETE RECEPTORS ***
(METERS,DEGREES)

```
(   41.0,  360.0), (   50.5,   22.5), (   79.1,   45.0), (   62.9,   67.5), (  586.0,   90.0),
(  786.0,  112.5), (  772.0,  135.0), (  743.0,  157.5), (  800.0,  180.0), (  829.0,  202.5),
(  857.0,  225.0), (  657.0,  247.5), (  329.0,  270.0), (  117.2,  292.5), (   46.7,  315.0),
(   40.0,  337.5), ( 1157.0,  118.5), ( 1543.0,  134.5), (
```

*** WOBURN - EAST HIDE PILE - CASE #1   ***

*** SOURCE DATA ***

```
                 EMISSION RATE                                         TEMP.    EXIT VEL.
                    TYPE=0,1                                          TYPE=0     TYPE=0
       T W      (GRAMS/SEC)                                          (DEG.K);  (M/SEC);              BLDG.     BLDG.     BLDG.
       Y A NUMBER    TYPE=2                           BASE           VERT.DIM  HORZ.DIM DIAMETER   HEIGHT    LENGTH     WIDTH
SOURCE P K  PART.  (GRAMS/SEC)      X         Y       ELEV.    HEIGHT   TYPE=1    TYPE=1,2  TYPE=0    TYPE=0    TYPE=0    TYPE=0
NUMBER E E  CATS. *PER METER**2 (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS) (METERS) (METERS) (METERS)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     1 0 0    0   0.10000E-01      0.0       0.0      0.0     10.00   999.00      0.43      0.46      0.00      0.00      0.00
* CALM HOURS (=1) FOR DAY 111 *  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 126 *  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 131 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 164 *  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 220 *  1  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 277 *  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 278 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 314 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 317 *  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 331 *  0  0  0  0  0  0  0  1  1  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0
```

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.17605 AND OCCURRED AT (100.0, 202.5) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.71738 (158,10)	3.82143 (158,10)	5.10225 (353,14)	4.92400 (151,15)	4.02183 (151,15)
315.0 /	0.70279 (163,11)	3.76769 (163,11)	5.46605 (111, 6)	5.73502 (175, 1)	5.53618 (175, 1)
292.5 /	0.52891 (161,12)	3.82310 (161,12)	5.55276 (244,18)	5.54675 (244,18)	4.36185 (201,22)
270.0 /	0.13295 (166,10)	3.17833 (245, 9)	6.05979 (319,11)	5.32351 (175, 2)	5.11280 (175, 2)
247.5 /	0.13346 (209,11)	3.24797 (128,12)	5.68334 (300,12)	5.72212 (306,10)	5.52965 (306,10)
225.0 /	0.07092 (266, 9)	3.22677 (300,11)	5.70078 (208,13)	5.64493 (40, 2)	5.49049 (40, 2)
202.5 /	0.13333 (184,10)	3.23835 (259, 9)	6.17605 (294,10)	5.81392 (343,10)	5.65180 (343,10)
180.0 /	0.13346 (161,10)	3.27209 (220, 9)	5.44245 (300, 8)	5.25662 (52,18)	4.33471 (52,18)
157.5 /	0.14645 (189,12)	3.06893 (148, 8)	4.00608 (318,11)	5.88686 (220, 6)	5.68879 (220, 6)
135.0 /	0.13605 (219,12)	3.27889 (159,10)	4.81762 (135, 7)	5.44336 (157, 6)	4.47412 (157, 6)
112.5 /	0.25433 (191,12)	3.26411 (168, 8)	5.01899 (318,13)	5.31584 (250, 7)	4.35954 (250, 7)
90.0 /	0.72929 (191,12)	3.86233 (191,12)	5.18491 (259, 8)	5.25114 (103, 2)	5.07629 (103, 2)
67.5 /	0.60022 (178,13)	3.38032 (158, 8)	4.96685 (167, 7)	4.61725 (53, 9)	4.43491 (53, 9)
45.0 /	0.73529 (191,11)	3.88947 (191,11)	5.12311 (225, 7)	4.91226 (282, 7)	4.48391 (192,20)
22.5 /	0.17348 (191,11)	3.12533 (157, 8)	4.94688 (157, 8)	4.94908 (232, 2)	4.03225 (232, 2)
360.0 /	0.13518 (186,10)	3.16950 (159,15)	6.16422 (135, 9)	5.28394 (334, 3)	5.09286 (334, 3)

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.17605 AND OCCURRED AT (100.0, 202.5) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	2.95594 (151,15)	2.21191 (151,15)	1.70601 (151,15)	1.35362 (151,15)	1.10028 (151,15)
315.0 /	4.34826 (175, 1)	3.37256 (175, 1)	2.65946 (175, 1)	2.14195 (175, 1)	1.76002 (175, 1)
292.5 /	3.21647 (201,22)	2.41383 (201,22)	1.86651 (201,22)	1.52922 (302,23)	1.64779 (302,23)
270.0 /	4.02566 (52,19)	3.12480 (52,19)	2.46319 (52,19)	1.98216 (52,19)	1.62694 (52,19)
247.5 /	4.34497 (306,10)	3.37076 (306,10)	2.65839 (306,10)	2.14128 (306,10)	1.90088 (37,24)
225.0 /	4.32524 (40, 2)	3.53377 (331, 7)	2.99608 (331, 7)	2.59631 (331, 7)	2.29183 (331, 7)
202.5 /	4.45416 (343,10)	3.46221 (343,10)	2.73444 (343,10)	2.20506 (343,10)	1.81371 (343,10)
180.0 /	3.20376 (52,18)	2.40715 (52,18)	1.86265 (52,18)	1.48196 (52,18)	1.20749 (52,18)
157.5 /	4.47280 (220, 6)	3.47240 (220, 6)	2.74046 (220, 6)	2.20885 (220, 6)	1.81623 (220, 6)
135.0 /	3.30486 (157, 6)	2.48332 (157, 6)	1.92223 (157, 6)	1.53001 (157, 6)	1.39255 (319, 1)
112.5 /	3.21539 (250, 7)	2.41327 (250, 7)	1.86619 (250, 7)	1.48415 (250, 7)	1.20893 (250, 7)
90.0 /	3.98180 (103, 2)	3.08266 (103, 2)	2.42617 (103, 2)	1.95039 (103, 2)	1.59974 (103, 2)
67.5 /	3.45903 (53, 9)	2.66485 (53, 9)	2.08832 (53, 9)	1.67234 (53, 9)	1.59616 (102,23)
45.0 /	3.48345 (192,20)	2.67808 (192,20)	2.09607 (192,20)	1.67719 (192,20)	1.57280 (122, 5)
22.5 /	3.10875 (255,18)	2.52571 (255,18)	2.12962 (255,18)	1.84359 (255,18)	1.62711 (255,18)
360.0 /	3.99012 (334, 3)	3.08720 (334, 3)	2.42884 (334, 3)	1.95207 (334, 3)	1.89046 (107,20)

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	2.00875	(204, 8)	50.5	22.5	3.20363	(157, 8)
79.1	45.0	4.50984	(132, 8)	62.9	67.5	4.53423	(158, 8)
586.0	90.0	2.50572	(103, 2)	786.0	112.5	1.24255	(250, 7)
772.0	135.0	1.38401	(319, 1)	743.0	157.5	2.02588	(220, 6)
800.0	180.0	1.20749	(52,18)	829.0	202.5	1.71961	(343,10)
857.0	225.0	2.14900	(331, 7)	657.0	247.5	2.34399	(306,10)
329.0	270.0	4.79541	(52,19)	117.2	292.5	6.42791	(244,18)
46.7	315.0	3.66730	(163,11)	40.0	337.5	3.22876	(158,10)
1157.0	118.5	1.89859	(122, 3)	1543.0	134.5	1.21868	(319, 1)

2ND HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 5.60827 AND OCCURRED AT (100.0, 225.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.13466 (231,11)	3.07793 (157, 9)	4.83843 (248,18)	4.73501 (248,18)	3.67619 (25, 5)
315.0 /	0.34311 (161,12)	3.39360 (164,11)	4.81309 (126,18)	5.51948 (111, 6)	4.02180 (283, 7)
292.5 /	0.28198 (163,11)	3.32757 (102, 9)	5.47806 (163,19)	5.32135 (201,22)	3.53551 (238, 7)
270.0 /	0.12888 (192,11)	3.17706 (277,11)	5.04166 (277,11)	5.21647 (52,19)	5.10674 (52,19)
247.5 /	0.13333 (296,12)	3.08639 (192, 9)	5.26962 (35,12)	4.62423 (136,14)	3.52736 (136,14)
225.0 /	0.06555 (293,12)	3.13499 (35,11)	5.60827 (151,19)	5.39926 (5, 8)	5.11414 (175, 5)
202.5 /	0.12483 (82,11)	2.87616 (184,10)	5.15784 (166, 6)	4.87574 (53, 5)	4.46650 (300, 7)
180.0 /	0.11095 (168,10)	3.12401 (85,11)	5.18306 (270, 9)	4.91223 (133,17)	4.01689 (133,17)
157.5 /	0.14155 (219,11)	2.79250 (229, 9)	3.68026 (217, 7)	4.92733 (250, 5)	4.02320 (250, 5)
135.0 /	0.13404 (273,12)	3.06246 (191,13)	4.23018 (178, 8)	4.61110 (343, 5)	3.52231 (343, 5)
112.5 /	0.14416 (144,11)	3.23283 (191, 8)	4.63810 (167, 8)	4.29330 (269, 6)	3.25793 (269, 6)
90.0 /	0.66766 (163,10)	3.62598 (163,10)	5.04491 (300, 9)	4.65930 (111, 3)	4.45600 (111, 3)
67.5 /	0.34416 (163,10)	3.33312 (178,13)	4.54987 (114, 7)	4.61725 (73, 1)	4.43489 (73, 1)
45.0 /	0.47838 (178,13)	3.14983 (114,10)	4.78306 (203, 6)	4.89069 (351,24)	4.01692 (282, 7)
22.5 /	0.10064 (197,11)	2.63457 (197, 8)	4.55744 (282, 9)	4.94090 (211,24)	4.02885 (211,24)
360.0 /	0.12937 (91,13)	3.04803 (204, 8)	4.42543 (159, 6)	5.24847 (315, 2)	5.07494 (315, 2)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 5.60827 AND OCCURRED AT (100.0, 225.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	2.84261 (25, 5)	2.17417 (25, 5)	1.69317 (25, 5)	1.34842 (25, 5)	1.09666 (25, 5)
315.0 /	2.95593 (283, 7)	2.21191 (283, 7)	1.70601 (283, 7)	1.35361 (283, 7)	1.37236 (302,20)
292.5 /	2.53531 (238, 7)	1.87535 (238, 7)	1.43779 (238, 7)	1.48436 (201,22)	1.20907 (201,22)
270.0 /	4.00013 (175, 2)	3.09265 (175, 2)	2.43206 (175, 2)	1.95410 (175, 2)	1.60220 (175, 2)
247.5 /	2.53162 (136,14)	1.87344 (136,14)	1.45754 (37,24)	1.76269 (37,24)	1.90088 (72, 3)
225.0 /	4.24544 (331, 7)	3.35999 (40, 2)	2.65202 (40, 2)	2.13727 (40, 2)	1.75691 (40, 2)
202.5 /	3.47479 (300, 7)	2.67338 (300, 7)	2.09333 (300, 7)	1.73036 (66, 2)	1.67109 (66, 2)
180.0 /	2.95363 (133,17)	2.21070 (133,17)	1.70531 (133,17)	1.35317 (133,17)	1.19949 (4, 5)
157.5 /	2.95658 (250, 5)	2.21225 (250, 5)	1.70621 (250, 5)	1.56508 (4, 7)	1.68148 (4, 7)
135.0 /	2.52933 (343, 5)	1.87226 (343, 5)	1.43602 (343, 5)	1.34139 (319, 1)	1.24722 (157, 6)
112.5 /	2.32906 (269, 6)	1.71801 (269, 6)	1.31389 (269, 6)	1.06741 (37,22)	1.05922 (37,22)
90.0 /	3.46956 (111, 3)	2.67055 (111, 3)	2.09166 (111, 3)	1.67444 (111, 3)	1.36828 (111, 3)
67.5 /	3.45902 (73, 1)	2.66483 (73, 1)	2.08831 (73, 1)	1.67234 (73, 1)	1.36691 (53, 9)
45.0 /	2.95365 (282, 7)	2.21072 (282, 7)	1.70532 (282, 7)	1.62940 (122, 5)	1.37010 (192,20)
22.5 /	2.96079 (232, 2)	2.21445 (232, 2)	1.70747 (232, 2)	1.35452 (232, 2)	1.37914 (126, 4)
360.0 /	3.98112 (315, 2)	3.08230 (315, 2)	2.42595 (315, 2)	1.95026 (315, 2)	1.60085 (334, 3)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	1.98573	(159,15)	50.5	22.5	2.68649	(197, 8)
79.1	45.0	4.25935	(158, 9)	62.9	67.5	4.28678	(232,10)
586.0	90.0	2.16161	(111, 3)	786.0	112.5	1.06233	(37,22)
772.0	135.0	1.31781	(157, 6)	743.0	157.5	1.62460	(4, 7)
800.0	180.0	1.19949	(4, 5)	829.0	202.5	1.64670	(66, 2)
857.0	225.0	1.58384	(40, 2)	657.0	247.5	1.64681	(37,24)
329.0	270.0	4.78779	(175, 2)	117.2	292.5	5.74031	(163,19)
46.7	315.0	2.91728	(164,11)	40.0	337.5	1.84497	(231,11)
1157.0	118.5	1.10601	(131, 3)	1543.0	134.5	0.97651	(340, 2)

ISCST - 1972

```
                    ISCST               (DATED 88348)

1 2 2 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
   1    10    16    18     0     0     0     0
  0.25000E+02  0.50000E+02  0.10000E+03  0.20000E+03  0.30000E+03  0.40000E+03  0.50000E+03  0.60000E+03
  0.70000E+03  0.80000E+03
  0.36000E+03  0.22500E+02  0.45000E+02  0.67500E+02  0.90000E+02  0.11250E+03  0.13500E+03  0.15750E+03
  0.18000E+03  0.20250E+03  0.22500E+03  0.24750E+03  0.27000E+03  0.29250E+03  0.31500E+03  0.33750E+03
  0.41000E+02  0.36000E+03
  0.50500E+02  0.22500E+02
  0.79100E+02  0.45000E+02
  0.62900E+02  0.67500E+02
  0.58600E+03  0.90000E+02
  0.78600E+03  0.11250E+03
  0.77200E+03  0.13500E+03
  0.74300E+03  0.15750E+03
  0.80000E+03  0.18000E+03
  0.82900E+03  0.20250E+03
  0.85700E+03  0.22500E+03
  0.65700E+03  0.24750E+03
  0.32900E+03  0.27000E+03
  0.11720E+03  0.29250E+03
  0.46700E+02  0.31500E+03
  0.40000E+02  0.33750E+03
  0.11570E+04  0.11850E+03
  0.15430E+04  0.13450E+03
  0.10000E+02  0.15400E+01  0.30900E+01  0.51400E+01  0.82300E+01  0.10800E+02
  0.10000E+07  0.00000E+00(GRAMS/SEC) (MICROGRAMS PER CUBIC METER) 9 3
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111111111111111111111111111111111111
14739    72 14764    72
  1 0 0 0 0  1.000E-2  0.000E+0  0.000E+0  0.000E+0  1.000E+1  9.990E+2  4.300E-1  4.600E-1  0.000E+0  0.000E+0  0.000E+0
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          *** WOBURN - EAST HIDE PILE - CASE #1                          ***

CALCULATE (CONCENTRATION=1,DEPOSITION=2)                              ISW(1) =   1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)               ISW(2) =   2
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                      ISW(3) =   2
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                              ISW(4) =   0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                         ISW(5) =   0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                      ISW(6) =   1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:
  HOURLY (YES=1,NO=0)                                                 ISW(7) =   1
  2-HOUR (YES=1,NO=0)                                                 ISW(8) =   0
  3-HOUR (YES=1,NO=0)                                                 ISW(9) =   0
  4-HOUR (YES=1,NO=0)                                                ISW(10) =   0
  6-HOUR (YES=1,NO=0)                                                ISW(11) =   0
  8-HOUR (YES=1,NO=0)                                                ISW(12) =   0
  12-HOUR (YES=1,NO=0)                                               ISW(13) =   0
  24-HOUR (YES=1,NO=0)                                               ISW(14) =   0
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                                  ISW(15) =   0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):
  DAILY TABLES (YES=1,NO=0)                                          ISW(16) =   0
  HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                       ISW(17) =   1
  MAXIMUM 50 TABLES (YES=1,NO=0)                                     ISW(18) =   0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)            ISW(19) =   1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)    ISW(20) =   0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)            ISW(21) =   1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)     ISW(22) =   1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                    ISW(23) =   0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)                ISW(24) =   1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)          ISW(25) =   2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)                ISW(26) =   1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)              ISW(27) =   1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                              ISW(28) =   1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                     ISW(29) =   1
DEBUG OPTION CHOSEN (YES=1,NO=2)                                     ISW(30) =   1
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)                  ISW(31) =   0

NUMBER OF INPUT SOURCES                                               NSOURC =   1
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                              NGROUP =   0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)                  IPERD =   0
NUMBER OF X (RANGE) GRID VALUES                                       NXPNTS =  10
NUMBER OF Y (THETA) GRID VALUES                                       NYPNTS =  16
NUMBER OF DISCRETE RECEPTORS                                          NXWYPT =  18
SOURCE EMISSION RATE UNITS CONVERSION FACTOR                              TK =.10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                      ZR =  10.00  METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                              IMET =   9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION                   DECAY =0.000000E+00
SURFACE STATION NO.                                                      ISS = 14739
YEAR OF SURFACE DATA                                                     ISY = 72
UPPER AIR STATION NO.                                                    IUS = 14764
YEAR OF UPPER AIR DATA                                                   IUY = 72
ALLOCATED DATA STORAGE                                                 LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                             MIMIT =  1595 WORDS
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*** WOBURN - EAST HIDE PILE - CASE #1                                   ***

              *** METEOROLOGICAL DAYS TO BE PROCESSED ***
                                (IF=1)

1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1

       *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                (METERS/SEC)

                  1.54,   3.09,   5.14,   8.23,  10.80,

                      *** WIND PROFILE EXPONENTS ***
```

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

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*** WOBURN - EAST HIDE PILE - CASE #1                                ***


                       *** RANGES OF POLAR GRID SYSTEM ***
                                   (METERS)

    25.0,      50.0,     100.0,     200.0,     300.0,     400.0,     500.0,     600.0,     700.0,     800.0,


                       *** RADIAL ANGLES OF POLAR GRID SYSTEM ***

                                   (DEGREES)

   360.0,      22.5,      45.0,      67.5,      90.0,     112.5,     135.0,     157.5,     180.0,     202.5,
   225.0,     247.5,     270.0,     292.5,     315.0,     337.5,


                   *** RANGE,THETA COORDINATES OF DISCRETE RECEPTORS ***
                                (METERS,DEGREES)

 (    41.0,   360.0), (    50.5,    22.5), (    79.1,    45.0), (    62.9,    67.5), (   586.0,    90.0),
 (   786.0,   112.5), (   772.0,   135.0), (   743.0,   157.5), (   800.0,   180.0), (   829.0,   202.5),
 (   857.0,   225.0), (   657.0,   247.5), (   329.0,   270.0), (   117.2,   292.5), (    46.7,   315.0),
 (    40.0,   337.5), (  1157.0,   118.5), (  1543.0,   134.5), (
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*** WOBURN - EAST HIDE PILE - CASE #1                              ***

                                  *** SOURCE DATA ***

                EMISSION RATE                                         TEMP.     EXIT VEL.
                   TYPE=0,1                                           TYPE=0     TYPE=0
        T W      (GRAMS/SEC)                                          (DEG.K);   (M/SEC);             BLDG.     BLDG.     BLDG.
        Y A NUMBER    TYPE=2                           BASE           VERT.DIM   HORZ.DIM DIAMETER   HEIGHT    LENGTH    WIDTH
 SOURCE P K  PART.  (GRAMS/SEC)      X         Y       ELEV.   HEIGHT   TYPE=1   TYPE=1,2  TYPE=0    TYPE=0    TYPE=0    TYPE=0
 NUMBER E E  CATS. *PER METER**2 (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS) (METERS) (METERS) (METERS)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

      1 0 0    0  0.10000E-01      0.0       0.0      0.0    10.00   999.00      0.43      0.46      0.00      0.00      0.00
* CALM HOURS (=1) FOR DAY 178 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0
* CALM HOURS (=1) FOR DAY 183 *  0  0  0  0  0  0  0  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 190 *  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 193 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  1
* CALM HOURS (=1) FOR DAY 194 *  1  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 232 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0
* CALM HOURS (=1) FOR DAY 250 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0
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*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.20188 AND OCCURRED AT (100.0, 270.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.25227 (149,10)	3.26410 (142,11)	4.00719 (104, 9)	5.29638 (139, 2)	5.09914 (139, 2)
315.0 /	0.71208 (148,11)	3.81285 (148,11)	5.04836 (189, 9)	5.89711 (173, 3)	5.69397 (173, 3)
292.5 /	0.66656 (189,11)	3.62417 (189,11)	6.02754 (80,10)	4.74856 (275,16)	4.47722 (231, 3)
270.0 /	0.42487 (204,13)	4.50830 (204,13)	6.20188 (209,10)	5.87075 (177,22)	5.73468 (177,22)
247.5 /	0.18166 (204,13)	3.38939 (238,15)	4.24106 (238,15)	5.70927 (138,23)	5.52316 (138,23)
225.0 /	0.44877 (232,12)	4.71055 (232,12)	5.59597 (158, 6)	5.65761 (95,20)	5.49695 (95,20)
202.5 /	0.14025 (224,12)	2.99277 (180,13)	5.37146 (206, 8)	5.73207 (303,15)	5.58412 (183, 2)
180.0 /	0.62506 (180,12)	3.44156 (180,12)	5.13912 (205,13)	5.32493 (169, 5)	4.36333 (169, 5)
157.5 /	0.41132 (180,12)	2.98878 (212, 8)	6.03505 (190, 8)	5.33819 (169, 6)	5.12017 (169, 6)
135.0 /	0.61197 (186,13)	4.25692 (186,13)	5.55277 (181, 7)	5.54675 (181, 7)	3.53167 (159,17)
112.5 /	0.45803 (179,13)	3.42317 (179,13)	5.11124 (226,11)	5.29311 (138,24)	5.09750 (138,24)
90.0 /	0.61322 (179,12)	4.25967 (179,12)	6.05889 (194, 8)	4.70952 (181, 6)	4.48110 (181, 6)
67.5 /	0.72808 (179,10)	3.87349 (179,10)	5.56065 (234, 8)	5.54922 (234, 8)	4.35355 (142, 5)
45.0 /	0.22358 (179,10)	3.27400 (122,11)	5.66597 (144, 7)	5.68947 (115, 6)	5.51313 (115, 6)
22.5 /	0.12809 (149,10)	3.12938 (97,11)	6.01791 (179,15)	5.72857 (162, 3)	5.53291 (162, 3)
360.0 /	0.71504 (149,10)	3.81765 (149,10)	6.09933 (277,10)	5.68019 (324,21)	5.50842 (324,21)

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.20188 AND OCCURRED AT (100.0, 270.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	3.99327 (139, 2)	3.08891 (139, 2)	2.42986 (139, 2)	1.95271 (139, 2)	1.60127 (139, 2)
315.0 /	4.47541 (173, 3)	3.47382 (173, 3)	2.74130 (173, 3)	2.20938 (173, 3)	1.89421 (45, 6)
292.5 /	3.48012 (231, 3)	2.67627 (231, 3)	2.09501 (231, 3)	1.67653 (231, 3)	1.36967 (231, 3)
270.0 /	4.52803 (177,22)	3.52314 (177,22)	2.78421 (177,22)	2.24606 (177,22)	1.84793 (177,22)
247.5 /	4.34170 (138,23)	3.36898 (138,23)	2.65734 (138,23)	2.14062 (138,23)	1.75913 (138,23)
225.0 /	4.32850 (95,20)	3.36177 (95,20)	2.65308 (95,20)	2.13794 (95,20)	1.75735 (95,20)
202.5 /	4.40361 (183, 2)	3.42275 (183, 2)	2.70245 (183, 2)	2.17837 (183, 2)	1.79096 (183, 2)
180.0 /	3.21716 (169, 5)	2.41419 (169, 5)	1.86672 (169, 5)	1.48448 (169, 5)	1.35666 (349, 4)
157.5 /	4.00382 (169, 6)	3.09465 (169, 6)	2.43324 (169, 6)	1.95483 (169, 6)	1.60268 (169, 6)
135.0 /	2.53358 (159,17)	1.87445 (159,17)	1.43727 (159,17)	1.52361 (244, 5)	1.64250 (244, 5)
112.5 /	3.99244 (138,24)	3.08846 (138,24)	2.42959 (138,24)	1.95254 (138,24)	1.60116 (138,24)
90.0 /	3.48207 (181, 6)	2.67733 (181, 6)	2.09565 (181, 6)	1.67693 (181, 6)	1.36994 (181, 6)
67.5 /	3.21258 (142, 5)	2.41179 (142, 5)	1.86533 (142, 5)	1.48362 (142, 5)	1.37832 (284,20)
45.0 /	4.33665 (115, 6)	3.36623 (115, 6)	2.65571 (115, 6)	2.13959 (115, 6)	1.75845 (115, 6)
22.5 /	4.34661 (162, 3)	3.37167 (162, 3)	2.65892 (162, 3)	2.14161 (162, 3)	1.75980 (162, 3)
360.0 /	4.33428 (324,21)	3.36493 (324,21)	2.65495 (324,21)	2.13911 (324,21)	1.75813 (324,21)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	3.32608	(149,10)	50.5	22.5	3.18069	(97,11)
79.1	45.0	4.75202	(250,10)	62.9	67.5	4.83637	(191, 9)
586.0	90.0	2.16589	(181, 6)	786.0	112.5	1.64440	(138,24)
772.0	135.0	1.61664	(244, 5)	743.0	157.5	1.79059	(169, 6)
800.0	180.0	1.35666	(349, 4)	829.0	202.5	1.69781	(183, 2)
857.0	225.0	1.58419	(95,20)	657.0	247.5	2.34318	(138,23)
329.0	270.0	5.38675	(177,22)	117.2	292.5	5.97870	(200, 9)
46.7	315.0	3.71113	(148,11)	40.0	337.5	1.88731	(253,14)
1157.0	118.5	1.26949	(180,24)	1543.0	134.5	1.63436	(244, 5)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.03703 AND OCCURRED AT (100.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.13037 (207,11)	3.08137 (253,14)	3.96894 (268, 9)	5.27081 (102,13)	4.47723 (231, 1)
315.0 /	0.47720 (191,12)	3.33188 (189,10)	4.77319 (122,18)	4.78090 (185, 7)	3.53420 (178,19)
292.5 /	0.57052 (191,12)	3.26734 (138,14)	5.81100 (142, 9)	4.70178 (231, 3)	4.46530 (137, 2)
270.0 /	0.15045 (210,13)	3.08546 (234,11)	5.02967 (91, 7)	5.27274 (91, 5)	5.07494 (95,19)
247.5 /	0.13467 (245,10)	2.97900 (238,14)	4.06858 (322,14)	4.88081 (348, 2)	4.53257 (199,20)
225.0 /	0.11790 (181, 9)	3.17650 (188, 9)	4.45200 (229, 9)	5.27435 (12, 4)	4.34217 (12, 4)
202.5 /	0.11428 (180,13)	2.94597 (71,10)	5.09325 (304,12)	5.72579 (183, 2)	5.53469 (303,15)
180.0 /	0.13404 (232,11)	3.26854 (188, 8)	4.98820 (262, 8)	5.27081 (341,13)	4.34069 (341,13)
157.5 /	0.23395 (186,13)	2.95985 (79,14)	5.63522 (190,19)	4.73262 (345,17)	4.47198 (183, 1)
135.0 /	0.43071 (179,13)	3.27698 (239,10)	5.18174 (243, 8)	4.63543 (159,17)	3.52185 (341, 9)
112.5 /	0.23447 (179,12)	3.05913 (180, 8)	4.97904 (122,10)	5.27274 (345, 7)	4.44936 (84,16)
90.0 /	0.14898 (179,10)	3.38646 (191, 8)	5.36924 (179, 9)	4.70707 (234, 7)	4.47985 (234, 7)
67.5 /	0.14982 (164,10)	3.40074 (179,14)	5.15787 (285, 8)	5.30151 (142, 5)	3.45302 (234, 8)
45.0 /	0.12967 (180,11)	2.96926 (155, 8)	4.44021 (250,10)	4.31190 (262, 7)	3.26504 (262, 7)
22.5 /	0.12780 (135, 8)	2.84274 (277,11)	5.38807 (160, 9)	5.46006 (168,20)	4.48111 (168,20)
360.0 /	0.15187 (199,12)	3.27400 (206, 9)	6.03703 (58,13)	4.91227 (82,14)	4.47722 (178,21)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.03703 AND OCCURRED AT (100.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	3.48013 (231, 1)	2.67628 (231, 1)	2.09502 (231, 1)	1.67654 (231, 1)	1.36968 (231, 1)
315.0 /	2.57165 (231, 6)	1.93030 (4, 8)	1.62420 (4, 8)	1.75560 (45, 6)	1.81659 (173, 3)
292.5 /	3.47420 (137, 2)	2.67306 (137, 2)	2.09314 (137, 2)	1.67536 (137, 2)	1.36890 (137, 2)
270.0 /	3.98112 (95,19)	3.08229 (95,19)	2.42595 (95,19)	1.95026 (95,19)	1.59965 (95,19)
247.5 /	3.53271 (199,20)	2.72059 (199,20)	2.13152 (199,20)	1.70669 (199,20)	1.39483 (199,20)
225.0 /	3.20726 (12, 4)	2.40899 (12, 4)	1.86372 (12, 4)	1.48262 (12, 4)	1.38531 (287,24)
202.5 /	4.34750 (303,15)	3.37215 (303,15)	2.65921 (303,15)	2.14179 (303,15)	1.75991 (303,15)
180.0 /	3.20656 (341,13)	2.40863 (341,13)	1.86351 (341,13)	1.48249 (341,13)	1.20915 (169, 5)
157.5 /	3.47752 (183, 1)	2.67486 (183, 1)	2.09419 (183, 1)	1.67603 (183, 1)	1.37238 (251, 3)
135.0 /	2.52912 (341, 9)	1.87215 (341, 9)	1.43596 (341, 9)	1.19231 (70, 5)	1.19531 (70, 5)
112.5 /	3.46623 (84,16)	2.66874 (84,16)	2.09061 (84,16)	1.67377 (84,16)	1.57498 (323,23)
90.0 /	3.48143 (234, 7)	2.67698 (234, 7)	2.09543 (234, 7)	1.67679 (234, 7)	1.36984 (234, 7)
67.5 /	2.25450 (234, 8)	1.57331 (234, 8)	1.30850 (181, 5)	1.32555 (284,20)	1.20858 (142, 5)
45.0 /	2.33228 (262, 7)	1.71968 (262, 7)	1.31484 (262, 7)	1.31644 (191, 4)	1.37011 (191, 4)
22.5 /	3.30813 (168,20)	2.48504 (168,20)	1.92323 (168,20)	1.53063 (168,20)	1.36658 (269,19)
360.0 /	3.48013 (178,21)	2.67627 (178,21)	2.09502 (178,21)	1.67653 (178,21)	1.55911 (279, 1)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	2.03838	(236,10)	50.5	22.5	2.88913	(277,11)
79.1	45.0	4.61453	(122,11)	62.9	67.5	4.55828	(179,14)
586.0	90.0	2.16566	(234, 7)	786.0	112.5	1.56995	(323,23)
772.0	135.0	1.19858	(70, 5)	743.0	157.5	1.53285	(183, 1)
800.0	180.0	1.20915	(169, 5)	829.0	202.5	1.68604	(10,24)
857.0	225.0	1.39206	(287,24)	657.0	247.5	1.87292	(199,20)
329.0	270.0	4.75700	(95,19)	117.2	292.5	5.90361	(91, 6)
46.7	315.0	2.86295	(189,10)	40.0	337.5	1.88683	(142,11)
1157.0	118.5	1.19359	(244, 3)	1543.0	134.5	0.96702	(180,23)

ISCST - 1973

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               ISCST              (DATED 88348)

1 2 2 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
   1     10     16     18      0      0      0      0
  0.25000E+02   0.50000E+02   0.10000E+03   0.20000E+03   0.30000E+03   0.40000E+03   0.50000E+03   0.60000E+03
  0.70000E+03   0.80000E+03
  0.36000E+03   0.22500E+02   0.45000E+02   0.67500E+02   0.90000E+02   0.11250E+03   0.13500E+03   0.15750E+03
  0.18000E+03   0.20250E+03   0.22500E+03   0.24750E+03   0.27000E+03   0.29250E+03   0.31500E+03   0.33750E+03
  0.41000E+02   0.36000E+03
  0.50500E+02   0.22500E+02
  0.79100E+02   0.45000E+02
  0.62900E+02   0.67500E+02
  0.58600E+03   0.90000E+02
  0.78600E+03   0.11250E+03
  0.77200E+03   0.13500E+03
  0.74300E+03   0.15750E+03
  0.80000E+03   0.18000E+03
  0.82900E+03   0.20250E+03
  0.85700E+03   0.22500E+03
  0.65700E+03   0.24750E+03
  0.32900E+03   0.27000E+03
  0.11720E+03   0.29250E+03
  0.46700E+02   0.31500E+03
  0.40000E+02   0.33750E+03
  0.11570E+04   0.11850E+03
  0.15430E+04   0.13450E+03
  0.10000E+02   0.15400E+01   0.30900E+01   0.51400E+01   0.82300E+01   0.10800E+02
  0.10000E+07   0.00000E+00(GRAMS/SEC) (MICROGRAMS PER CUBIC METER) 9 3
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
11111111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111111111111111111111111111111111111
14739    73 14764    73
  1 0 0 0 0  1.000E-2  0.000E+0  0.000E+0  0.000E+0  1.000E+1  9.990E+2  4.300E-1  4.600E-1  0.000E+0  0.000E+0  0.000E+0
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*** WOBURN - EAST HIDE PILE - CASE #1                          ***

CALCULATE (CONCENTRATION=1,DEPOSITION=2)                           ISW(1) =   1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)            ISW(2) =   2
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                   ISW(3) =   2
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                           ISW(4) =   0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                      ISW(5) =   0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                   ISW(6) =   1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:
  HOURLY (YES=1,NO=0)                                              ISW(7) =   1
  2-HOUR (YES=1,NO=0)                                              ISW(8) =   0
  3-HOUR (YES=1,NO=0)                                              ISW(9) =   0
  4-HOUR (YES=1,NO=0)                                             ISW(10) =   0
  6-HOUR (YES=1,NO=0)                                             ISW(11) =   0
  8-HOUR (YES=1,NO=0)                                             ISW(12) =   0
  12-HOUR (YES=1,NO=0)                                            ISW(13) =   0
  24-HOUR (YES=1,NO=0)                                            ISW(14) =   0
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                               ISW(15) =   0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):
  DAILY TABLES (YES=1,NO=0)                                       ISW(16) =   0
  HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                    ISW(17) =   1
  MAXIMUM 50 TABLES (YES=1,NO=0)                                  ISW(18) =   0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)         ISW(19) =   1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3) ISW(20) =   0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)         ISW(21) =   1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)  ISW(22) =   1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)                 ISW(23) =   0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)             ISW(24) =   1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)       ISW(25) =   2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)             ISW(26) =   1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)           ISW(27) =   1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                           ISW(28) =   1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)                  ISW(29) =   1
DEBUG OPTION CHOSEN (YES=1,NO=2)                                  ISW(30) =   1
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)               ISW(31) =   0

NUMBER OF INPUT SOURCES                                            NSOURC =   1
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                           NGROUP =   0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)               IPERD =   0
NUMBER OF X (RANGE) GRID VALUES                                    NXPNTS =  10
NUMBER OF Y (THETA) GRID VALUES                                    NYPNTS =  16
NUMBER OF DISCRETE RECEPTORS                                       NXWYPT =  18
SOURCE EMISSION RATE UNITS CONVERSION FACTOR                           TK =.10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                   ZR =  10.00  METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                           IMET =   9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION                DECAY =0.000000E+00
SURFACE STATION NO.                                                   ISS = 14739
YEAR OF SURFACE DATA                                                  ISY = 73
UPPER AIR STATION NO.                                                 IUS = 14764
YEAR OF UPPER AIR DATA                                                IUY = 73
ALLOCATED DATA STORAGE                                              LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                          MIMIT =  1595 WORDS
```

*** WOBURN - EAST HIDE PILE - CASE #1 ***

*** METEOROLOGICAL DAYS TO BE PROCESSED ***
(IF=1)

```
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1
```

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

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*** WOBURN - EAST HIDE PILE - CASE #1                          ***

                         *** RANGES OF POLAR GRID SYSTEM ***
                                       (METERS)

   25.0,      50.0,     100.0,     200.0,     300.0,     400.0,     500.0,     600.0,     700.0,     800.0,

                         *** RADIAL ANGLES OF POLAR GRID SYSTEM ***

                                       (DEGREES)

  360.0,      22.5,      45.0,      67.5,      90.0,     112.5,     135.0,     157.5,     180.0,     202.5,
  225.0,     247.5,     270.0,     292.5,     315.0,     337.5,

                   *** RANGE,THETA COORDINATES OF DISCRETE RECEPTORS ***
                                  (METERS,DEGREES)

(    41.0,    360.0), (    50.5,     22.5), (    79.1,     45.0), (    62.9,     67.5), (   586.0,     90.0),
(   786.0,    112.5), (   772.0,    135.0), (   743.0,    157.5), (   800.0,    180.0), (   829.0,    202.5),
(   857.0,    225.0), (   657.0,    247.5), (   329.0,    270.0), (   117.2,    292.5), (    46.7,    315.0),
(    40.0,    337.5), (  1157.0,    118.5), (  1543.0,    134.5), (
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*** WOBURN - EAST HIDE PILE - CASE #1                                ***

                              *** SOURCE DATA ***

               EMISSION RATE                                     TEMP.     EXIT VEL.
                  TYPE=0,1                                       TYPE=0     TYPE=0
       T W     (GRAMS/SEC)                                      (DEG.K);  (M/SEC);             BLDG.     BLDG.     BLDG.
       Y A NUMBER   TYPE=2                         BASE                  VERT.DIM  HORZ.DIM DIAMETER  HEIGHT    LENGTH    WIDTH
SOURCE P K  PART.  (GRAMS/SEC)     X         Y      ELEV.     HEIGHT    TYPE=1    TYPE=1,2  TYPE=0    TYPE=0    TYPE=0    TYPE=0
NUMBER E E  CATS. *PER METER**2 (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)  (METERS)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     1 0 0    0   0.10000E-01    0.0       0.0       0.0     10.00    999.00      0.43      0.46      0.00      0.00      0.00
* CALM HOURS (=1) FOR DAY  59 *  0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  60 *  0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  63 *  0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  67 *  0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  68 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0
* CALM HOURS (=1) FOR DAY  70 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0
* CALM HOURS (=1) FOR DAY  71 *  0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  74 *  0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  75 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  76 *  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  85 *  0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  88 *  0 0 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY  90 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0
* CALM HOURS (=1) FOR DAY 121 *  0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 129 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 130 *  1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 134 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0
* CALM HOURS (=1) FOR DAY 135 *  0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 136 *  0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 139 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 147 *  1 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 150 *  1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 151 *  1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 154 *  0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 157 *  0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 170 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 171 *  0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 175 *  0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 177 *  0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 182 *  0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 190 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 196 *  0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 197 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0
* CALM HOURS (=1) FOR DAY 202 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1
* CALM HOURS (=1) FOR DAY 203 *  1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 210 *  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1
* CALM HOURS (=1) FOR DAY 215 *  0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0
* CALM HOURS (=1) FOR DAY 219 *  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 231 *  0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 237 *  0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 347 *  0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
* CALM HOURS (=1) FOR DAY 354 *  1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 8.33207 AND OCCURRED AT (100.0, 180.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.70740 (205,13)	4.37384 (237,10)	6.09474 (154, 9)	5.61468 (108, 6)	5.12484 (214,22)
315.0 /	0.69182 (159,11)	4.41641 (104,10)	5.46129 (171, 7)	5.81748 (70,22)	5.70140 (89,21)
292.5 /	0.70803 (206,13)	4.19882 (197,12)	5.95186 (147, 8)	5.74792 (178, 1)	5.54268 (178, 1)
270.0 /	0.66766 (197,11)	4.57003 (230,12)	5.41045 (246,12)	5.75225 (202,10)	5.59764 (202,10)
247.5 /	0.44323 (211,11)	3.28089 (199,11)	5.36496 (32,15)	5.66909 (90, 8)	5.55507 (90, 8)
225.0 /	0.15078 (204,11)	2.55605 (203, 9)	5.60349 (156, 7)	5.67214 (198, 7)	5.08554 (323, 1)
202.5 /	0.12316 (262, 9)	3.25152 (282,10)	5.44635 (73, 8)	5.88060 (212, 6)	5.73972 (212, 6)
180.0 /	0.10025 (217,11)	3.38452 (197, 8)	8.33207 (283, 8)	5.88739 (237, 7)	5.74319 (237, 7)
157.5 /	0.13490 (238,11)	3.26677 (277,10)	5.80663 (269, 9)	5.67670 (66,21)	5.50665 (66,21)
135.0 /	0.55675 (205,12)	3.95176 (205,12)	5.55909 (197, 7)	5.66814 (197, 7)	5.48871 (33, 8)
112.5 /	0.69069 (205,11)	4.35603 (222,11)	5.21697 (206, 7)	5.33544 (196,20)	5.11879 (196,20)
90.0 /	0.44520 (174,10)	4.68300 (174,10)	5.09463 (105,10)	5.30826 (67,16)	5.10511 (67,16)
67.5 /	0.45487 (222,12)	4.71750 (222,12)	6.13157 (159, 8)	5.33828 (316, 9)	3.73206 (136, 5)
45.0 /	0.15163 (172,12)	3.39165 (192,11)	6.22719 (230, 8)	5.44537 (170, 2)	4.47496 (170, 2)
22.5 /	0.62759 (188,11)	4.58361 (188,10)	6.01543 (174,12)	5.77429 (60, 8)	5.63160 (60, 8)
360.0 /	0.72037 (143,12)	4.45802 (230,10)	6.20276 (140, 9)	5.90160 (182, 6)	5.75045 (182, 6)

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 8.33207 AND OCCURRED AT (100.0, 180.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	4.00615 (214,22)	3.09592 (214,22)	2.43398 (214,22)	1.95531 (214,22)	1.64449 (163, 3)
315.0 /	4.51119 (89,21)	3.51390 (89,21)	2.77875 (89,21)	2.40950 (320, 8)	2.13275 (320, 8)
292.5 /	4.35152 (178, 1)	3.37434 (178, 1)	2.66050 (178, 1)	2.14261 (178, 1)	1.76045 (178, 1)
270.0 /	4.41043 (202,10)	3.42648 (202,10)	2.70465 (202,10)	2.17976 (202,10)	1.79188 (202,10)
247.5 /	4.38892 (90, 8)	3.41470 (90, 8)	2.69768 (90, 8)	2.17536 (90, 8)	1.87361 (211,23)
225.0 /	3.98646 (323, 1)	3.08521 (323, 1)	2.42767 (323, 1)	1.95133 (323, 1)	1.60037 (323, 1)
202.5 /	4.53059 (212, 6)	3.52454 (212, 6)	2.78504 (212, 6)	2.24658 (212, 6)	1.84828 (212, 6)
180.0 /	4.53234 (237, 7)	3.52549 (237, 7)	2.78561 (237, 7)	2.24694 (237, 7)	1.84851 (237, 7)
157.5 /	4.33339 (66,21)	3.36444 (66,21)	2.65465 (66,21)	2.13893 (66,21)	1.75801 (66,21)
135.0 /	4.32435 (33, 8)	3.35950 (33, 8)	2.65173 (33, 8)	2.13709 (33, 8)	1.75679 (33, 8)
112.5 /	4.00311 (196,20)	3.09426 (196,20)	2.43300 (196,20)	1.95469 (196,20)	1.86640 (203,23)
90.0 /	3.99627 (67,16)	3.09054 (67,16)	2.43081 (67,16)	1.95331 (67,16)	1.87707 (197, 3)
67.5 /	2.89073 (136, 5)	2.21294 (136, 5)	1.72429 (136, 5)	1.71756 (149,24)	1.85832 (149,24)
45.0 /	3.30525 (170, 2)	2.48352 (170, 2)	1.92235 (170, 2)	1.53009 (170, 2)	1.64250 (196,24)
22.5 /	4.44395 (60, 8)	3.45662 (60, 8)	2.73114 (60, 8)	2.20297 (60, 8)	1.81233 (60, 8)
360.0 /	4.53601 (182, 6)	3.52750 (182, 6)	2.78679 (182, 6)	2.24769 (182, 6)	1.85476 (214, 3)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	3.35155	(143,12)	50.5	22.5	4.65362	(188,10)
79.1	45.0	5.90783	(230, 8)	62.9	67.5	5.07483	(222,12)
586.0	90.0	2.51070	(67,16)	786.0	112.5	1.85103	(203,23)
772.0	135.0	1.85241	(33, 8)	743.0	157.5	1.96141	(66,21)
800.0	180.0	1.84851	(237, 7)	829.0	202.5	1.75247	(212, 6)
857.0	225.0	1.44097	(323, 1)	657.0	247.5	2.38028	(90, 8)
329.0	270.0	5.25429	(202,10)	117.2	292.5	5.94903	(167,17)
46.7	315.0	4.14604	(229,12)	40.0	337.5	3.40512	(159,10)
1157.0	118.5	1.66601	(316, 1)	1543.0	134.5	1.43033	(325, 2)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.19318 AND OCCURRED AT (100.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.61573 (159,10)	4.26517 (159,10)	6.00843 (216,10)	5.43239 (275, 7)	4.46971 (275, 7)
315.0 /	0.66162 (154,10)	4.39309 (150,10)	5.37927 (216, 7)	5.80593 (89,21)	5.65361 (70,22)
292.5 /	0.60046 (197,12)	3.77619 (206,13)	5.66597 (167,17)	5.30827 (140,17)	5.10513 (140,17)
270.0 /	0.59724 (211,11)	3.98059 (230,11)	4.96467 (206,15)	5.74145 (176,23)	5.53942 (176,23)
247.5 /	0.34416 (197,11)	3.27054 (171, 8)	4.84496 (231, 7)	5.48725 (32,15)	5.14753 (157, 8)
225.0 /	0.12825 (198,11)	2.51015 (204,11)	5.57160 (198, 7)	5.60530 (156, 7)	4.48587 (67, 1)
202.5 /	0.06531 (282,10)	3.10363 (243,10)	5.12720 (215,18)	5.80739 (94, 2)	5.64849 (94, 2)
180.0 /	0.09818 (260, 9)	3.26582 (211, 8)	6.05067 (27,10)	5.62057 (283, 8)	5.12483 (186,13)
157.5 /	0.12093 (225,15)	3.23427 (205, 8)	5.63743 (211, 7)	5.27983 (74,22)	4.48396 (211, 6)
135.0 /	0.31454 (205,11)	3.83063 (229, 9)	5.38651 (236, 7)	5.64147 (33, 8)	4.53107 (216, 6)
112.5 /	0.63788 (222,11)	4.30243 (190,11)	5.05682 (84,10)	5.03938 (353,16)	4.01692 (274, 7)
90.0 /	0.28757 (219,11)	3.37487 (219,11)	4.77998 (229, 7)	4.73935 (26,16)	3.62170 (26,16)
67.5 /	0.15187 (162,10)	3.70708 (206,11)	5.36516 (114,12)	4.30783 (27, 8)	3.66972 (353,17)
45.0 /	0.13011 (206,11)	3.38550 (192,12)	5.13495 (190,14)	5.28339 (128, 6)	4.34597 (128, 6)
22.5 /	0.25093 (143,12)	3.96171 (230, 9)	5.63521 (195, 6)	5.69588 (90,19)	5.51637 (90,19)
360.0 /	0.66986 (183,10)	3.84796 (143,12)	6.19318 (114, 8)	5.78230 (88, 9)	5.68921 (88, 9)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 6.19318 AND OCCURRED AT (100.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	3.47609 (257,22)	2.67409 (257,22)	2.09374 (257,22)	1.79800 (108, 6)	1.60299 (214,22)
315.0 /	4.45508 (70,22)	3.46271 (70,22)	2.76872 (320, 8)	2.24261 (89,21)	1.84564 (89,21)
292.5 /	3.99628 (140,17)	3.09055 (140,17)	2.43082 (140,17)	1.95332 (140,17)	1.65173 (219, 4)
270.0 /	4.34987 (176,23)	3.37344 (176,23)	2.65997 (176,23)	2.14227 (176,23)	1.76023 (176,23)
247.5 /	4.04624 (157, 8)	3.13604 (157, 8)	2.46982 (157, 8)	1.98634 (157, 8)	1.78896 (90, 8)
225.0 /	3.50936 (67, 1)	2.70793 (67, 1)	2.12409 (67, 1)	1.70203 (67, 1)	1.39176 (67, 1)
202.5 /	4.45248 (94, 2)	3.46129 (94, 2)	2.73390 (94, 2)	2.20471 (94, 2)	1.81349 (94, 2)
180.0 /	4.00615 (186,13)	3.09592 (186,13)	2.43398 (186,13)	1.95530 (186,13)	1.60299 (186,13)
157.5 /	3.48348 (211, 6)	2.67809 (211, 6)	2.09609 (211, 6)	1.67721 (211, 6)	1.65589 (237, 5)
135.0 /	3.53196 (216, 6)	2.72018 (216, 6)	2.13128 (216, 6)	1.70654 (216, 6)	1.39473 (216, 6)
112.5 /	2.95364 (274, 7)	2.21071 (274, 7)	1.70532 (274, 7)	1.72111 (203,23)	1.60258 (196,20)
90.0 /	2.60281 (26,16)	1.92821 (26,16)	1.48006 (26,16)	1.73237 (197, 3)	1.64251 (216, 2)
67.5 /	2.83940 (353,17)	2.17243 (353,17)	1.69568 (216, 3)	1.71410 (216, 3)	1.66299 (216, 3)
45.0 /	3.20904 (128, 6)	2.40993 (128, 6)	1.86426 (128, 6)	1.52361 (196,24)	1.33284 (158,24)
22.5 /	4.33829 (90,19)	3.36712 (90,19)	2.65624 (90,19)	2.13992 (90,19)	1.75867 (90,19)
360.0 /	4.50500 (88, 9)	3.51051 (88, 9)	2.77674 (88, 9)	2.24134 (88, 9)	1.84901 (182, 6)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	3.15679	(183,10)	50.5	22.5	4.02568	(230, 9)
79.1	45.0	4.94086	(128, 9)	62.9	67.5	4.85084	(206, 8)
586.0	90.0	1.53285	(26,16)	786.0	112.5	1.64590	(196,20)
772.0	135.0	1.47295	(216, 6)	743.0	157.5	1.59544	(237, 5)
800.0	180.0	1.60299	(186,13)	829.0	202.5	1.71940	(94, 2)
857.0	225.0	1.25111	(67, 1)	657.0	247.5	2.17583	(157, 8)
329.0	270.0	5.19319	(176,23)	117.2	292.5	5.58071	(147, 8)
46.7	315.0	4.10209	(150,10)	40.0	337.5	3.18934	(205,13)
1157.0	118.5	1.45152	(211, 3)	1543.0	134.5	1.41525	(199, 1)

ISCST - 1974

ISCST (DATED 88348)

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1 2 2 0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 0 1 2 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0
   1    10    16    18     0     0     0     0
  0.25000E+02  0.50000E+02  0.10000E+03  0.20000E+03  0.30000E+03  0.40000E+03  0.50000E+03  0.60000E+03
  0.70000E+03  0.80000E+03
  0.36000E+03  0.22500E+02  0.45000E+02  0.67500E+02  0.90000E+02  0.11250E+03  0.13500E+03  0.15750E+03
  0.18000E+03  0.20250E+03  0.22500E+03  0.24750E+03  0.27000E+03  0.29250E+03  0.31500E+03  0.33750E+03
  0.41000E+02  0.36000E+03
  0.50500E+02  0.22500E+02
  0.79100E+02  0.45000E+02
  0.62900E+02  0.67500E+02
  0.58600E+03  0.90000E+02
  0.78600E+03  0.11250E+03
  0.77200E+03  0.13500E+03
  0.74300E+03  0.15750E+03
  0.80000E+03  0.18000E+03
  0.82900E+03  0.20250E+03
  0.85700E+03  0.22500E+03
  0.65700E+03  0.24750E+03
  0.32900E+03  0.27000E+03
  0.11720E+03  0.29250E+03
  0.46700E+02  0.31500E+03
  0.40000E+02  0.33750E+03
  0.11570E+04  0.11850E+03
  0.15430E+04  0.13450E+03
  0.10000E+02  0.15400E+01  0.30900E+01  0.51400E+01  0.82300E+01  0.10800E+02
  0.10000E+07  0.00000E+00(GRAMS/SEC) (MICROGRAMS PER CUBIC METER) 9 3
11111111111111111111111111111111111111111111111111111111111111111111111111111111
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11111111111111111111111111111111111111111111111111111111111111111111111111111111
1111111111111111111111111111111111111111111111
14739    74 14764    74
  1 0 0 0 0  1.000E-2  0.000E+0  0.000E+0  0.000E+0  1.000E+1  9.990E+2  4.300E-1  4.600E-1  0.000E+0  0.000E+0  0.000E+0
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         *** WOBURN - EAST HIDE PILE - CASE #1                          ***

CALCULATE (CONCENTRATION=1,DEPOSITION=2)                        ISW(1) =   1
RECEPTOR GRID SYSTEM (RECTANGULAR=1 OR 3, POLAR=2 OR 4)         ISW(2) =   2
DISCRETE RECEPTOR SYSTEM (RECTANGULAR=1,POLAR=2)                ISW(3) =   2
TERRAIN ELEVATIONS ARE READ (YES=1,NO=0)                        ISW(4) =   0
CALCULATIONS ARE WRITTEN TO TAPE (YES=1,NO=0)                   ISW(5) =   0
LIST ALL INPUT DATA (NO=0,YES=1,MET DATA ALSO=2)                ISW(6) =   1

COMPUTE AVERAGE CONCENTRATION (OR TOTAL DEPOSITION)
WITH THE FOLLOWING TIME PERIODS:
  HOURLY (YES=1,NO=0)                                           ISW(7) =   1
  2-HOUR (YES=1,NO=0)                                           ISW(8) =   0
  3-HOUR (YES=1,NO=0)                                           ISW(9) =   0
  4-HOUR (YES=1,NO=0)                                          ISW(10) =   0
  6-HOUR (YES=1,NO=0)                                          ISW(11) =   0
  8-HOUR (YES=1,NO=0)                                          ISW(12) =   0
  12-HOUR (YES=1,NO=0)                                         ISW(13) =   0
  24-HOUR (YES=1,NO=0)                                         ISW(14) =   0
PRINT 'N'-DAY TABLE(S) (YES=1,NO=0)                            ISW(15) =   0

PRINT THE FOLLOWING TYPES OF TABLES WHOSE TIME PERIODS ARE
SPECIFIED BY ISW(7) THROUGH ISW(14):
  DAILY TABLES (YES=1,NO=0)                                    ISW(16) =   0
  HIGHEST & SECOND HIGHEST TABLES (YES=1,NO=0)                 ISW(17) =   1
  MAXIMUM 50 TABLES (YES=1,NO=0)                               ISW(18) =   0
METEOROLOGICAL DATA INPUT METHOD (PRE-PROCESSED=1,CARD=2)      ISW(19) =   1
RURAL-URBAN OPTION (RU.=0,UR. MODE 1=1,UR. MODE 2=2,UR. MODE 3=3)  ISW(20) =   0
WIND PROFILE EXPONENT VALUES (DEFAULTS=1,USER ENTERS=2,3)      ISW(21) =   1
VERTICAL POT. TEMP. GRADIENT VALUES (DEFAULTS=1,USER ENTERS=2,3)   ISW(22) =   1
SCALE EMISSION RATES FOR ALL SOURCES (NO=0,YES>0)              ISW(23) =   0
PROGRAM CALCULATES FINAL PLUME RISE ONLY (YES=1,NO=2)          ISW(24) =   1
PROGRAM ADJUSTS ALL STACK HEIGHTS FOR DOWNWASH (YES=2,NO=1)    ISW(25) =   2
PROGRAM USES BUOYANCY INDUCED DISPERSION (YES=1,NO=2)          ISW(26) =   1
CONCENTRATIONS DURING CALM PERIODS SET = 0 (YES=1,NO=2)        ISW(27) =   1
REG. DEFAULT OPTION CHOSEN (YES=1,NO=2)                        ISW(28) =   1
TYPE OF POLLUTANT TO BE MODELLED (1=SO2,2=OTHER)               ISW(29) =   1
DEBUG OPTION CHOSEN (YES=1,NO=2)                               ISW(30) =   1
ABOVE GROUND (FLAGPOLE) RECEPTORS USED (YES=1,NO=0)            ISW(31) =   0

NUMBER OF INPUT SOURCES                                         NSOURC =   1
NUMBER OF SOURCE GROUPS (=0,ALL SOURCES)                        NGROUP =   0
TIME PERIOD INTERVAL TO BE PRINTED (=0,ALL INTERVALS)            IPERD =   0
NUMBER OF X (RANGE) GRID VALUES                                 NXPNTS =  10
NUMBER OF Y (THETA) GRID VALUES                                 NYPNTS =  16
NUMBER OF DISCRETE RECEPTORS                                    NXWYPT =  18
SOURCE EMISSION RATE UNITS CONVERSION FACTOR                        TK =.10000E+07
HEIGHT ABOVE GROUND AT WHICH WIND SPEED WAS MEASURED                ZR =  10.00  METERS
LOGICAL UNIT NUMBER OF METEOROLOGICAL DATA                        IMET =   9
DECAY COEFFICIENT FOR PHYSICAL OR CHEMICAL DEPLETION             DECAY =0.000000E+00
SURFACE STATION NO.                                                ISS = 14739
YEAR OF SURFACE DATA                                               ISY = 74
UPPER AIR STATION NO.                                              IUS = 14764
YEAR OF UPPER AIR DATA                                             IUY = 74
ALLOCATED DATA STORAGE                                           LIMIT = 43500 WORDS
REQUIRED DATA STORAGE FOR THIS PROBLEM RUN                       MIMIT =  1595 WORDS
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*** WOBURN - EAST HIDE PILE - CASE #1 ***

*** METEOROLOGICAL DAYS TO BE PROCESSED ***
(IF=1)

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1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1
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*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
(METERS/SEC)

1.54, 3.09, 5.14, 8.23, 10.80,

*** WIND PROFILE EXPONENTS ***

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY	WIND SPEED CATEGORY					
CATEGORY	1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

*** WOBURN - EAST HIDE PILE - CASE #1 ***

*** RANGES OF POLAR GRID SYSTEM ***
(METERS)

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    25.0,      50.0,     100.0,     200.0,     300.0,     400.0,     500.0,     600.0,     700.0,     800.0,
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*** RADIAL ANGLES OF POLAR GRID SYSTEM ***

(DEGREES)

```
   360.0,      22.5,      45.0,      67.5,      90.0,     112.5,     135.0,     157.5,     180.0,     202.5,
   225.0,     247.5,     270.0,     292.5,     315.0,     337.5,
```

*** RANGE,THETA COORDINATES OF DISCRETE RECEPTORS ***
(METERS,DEGREES)

```
(    41.0,     360.0), (     50.5,      22.5), (     79.1,      45.0), (     62.9,      67.5), (    586.0,      90.0),
(   786.0,     112.5), (    772.0,     135.0), (    743.0,     157.5), (    800.0,     180.0), (    829.0,     202.5),
(   857.0,     225.0), (    657.0,     247.5), (    329.0,     270.0), (    117.2,     292.5), (     46.7,     315.0),
(    40.0,     337.5), (   1157.0,     118.5), (   1543.0,     134.5), (
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*** WOBURN - EAST HIDE PILE - CASE #1                             ***

                                     *** SOURCE DATA ***

                  EMISSION RATE                                         TEMP.    EXIT VEL.
                     TYPE=0,1                                           TYPE=0    TYPE=0
         T W      (GRAMS/SEC)                                          (DEG.K);  (M/SEC);               BLDG.     BLDG.     BLDG.
         Y A NUMBER   TYPE=2                             BASE          VERT.DIM  HORZ.DIM DIAMETER  HEIGHT    LENGTH    WIDTH
SOURCE   P K  PART.  (GRAMS/SEC)     X         Y         ELEV.   HEIGHT   TYPE=1   TYPE=1,2  TYPE=0   TYPE=0    TYPE=0    TYPE=0
NUMBER   E E  CATS. *PER METER**2 (METERS) (METERS) (METERS) (METERS) (METERS)  (METERS) (METERS) (METERS) (METERS) (METERS)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

     1   0 0    0   0.10000E-01    0.0       0.0       0.0     10.00    999.00     0.43      0.46     0.00      0.00      0.00
* CALM HOURS (=1) FOR DAY 195 *  0  0  1  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0  0
* CALM HOURS (=1) FOR DAY 310 *  0  0  0  0  0  0  0  0  0  0  0  0  0  0  1  0  0  0  0  0  0  0  0  0
```

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 7.26706 AND OCCURRED AT (200.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.12908 (252,11)	3.26854 (159, 9)	5.60808 (243, 9)	5.31942 (271,23)	4.36104 (271,23)
315.0 /	0.15111 (224,12)	3.17209 (219,10)	4.96215 (166, 7)	5.71219 (178, 6)	5.52463 (178, 6)
292.5 /	0.18166 (189,12)	3.08686 (172,13)	5.12335 (243, 8)	5.08704 (243, 8)	4.46386 (178, 2)
270.0 /	0.43523 (189,12)	4.58886 (189,12)	4.80291 (341,12)	5.33218 (242,19)	5.11713 (242,19)
247.5 /	0.14685 (154,12)	3.08434 (218, 9)	4.56813 (174,15)	5.25705 (287, 7)	5.07929 (287, 7)
225.0 /	0.12228 (282,11)	2.75013 (61,12)	5.57886 (94, 8)	5.32621 (254, 9)	5.11414 (254, 9)
202.5 /	0.40176 (198,11)	3.23427 (232, 9)	3.53370 (232, 9)	5.82402 (83, 5)	5.65694 (83, 5)
180.0 /	0.66985 (198,12)	3.70280 (198,11)	5.61948 (290, 7)	4.70422 (242,16)	4.47846 (242,16)
157.5 /	0.14193 (192,11)	2.98083 (164, 8)	4.70506 (347,13)	5.25825 (19, 4)	4.33541 (19, 4)
135.0 /	0.71684 (170,11)	3.82057 (170,11)	4.59801 (141, 6)	4.31811 (96,13)	3.50911 (96,13)
112.5 /	0.25297 (170,11)	3.00403 (188,13)	4.73424 (224, 7)	4.60673 (84,17)	3.52063 (84,17)
90.0 /	0.14389 (136,11)	3.09529 (212, 8)	5.18507 (303,13)	4.27374 (6,16)	3.25042 (6,16)
67.5 /	0.60482 (194,12)	4.20846 (194,12)	4.92481 (26,10)	5.76487 (37,23)	5.62678 (37,23)
45.0 /	0.67546 (125,12)	3.68472 (125,12)	6.10602 (251, 9)	3.74749 (264,11)	2.71908 (264,11)
22.5 /	0.12853 (219,13)	3.22088 (163, 9)	4.54021 (26, 9)	5.32948 (263, 3)	5.11579 (263, 3)
360.0 /	0.14115 (172,10)	2.90414 (251,10)	5.82899 (170, 8)	7.26706 (324, 7)	5.72555 (324, 7)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 7.26706 AND OCCURRED AT (200.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	3.21609 (271,23)	2.41364 (271,23)	1.86640 (271,23)	1.48429 (271,23)	1.20902 (271,23)
315.0 /	4.34244 (178, 6)	3.36939 (178, 6)	2.65757 (178, 6)	2.14077 (178, 6)	1.87144 (178,24)
292.5 /	3.47346 (178, 2)	2.67267 (178, 2)	2.09290 (178, 2)	1.67521 (178, 2)	1.36879 (178, 2)
270.0 /	4.00229 (242,19)	3.09381 (242,19)	2.43274 (242,19)	1.95452 (242,19)	1.66759 (102, 5)
247.5 /	3.98331 (287, 7)	3.08349 (287, 7)	2.42666 (287, 7)	1.95070 (287, 7)	1.59995 (287, 7)
225.0 /	4.00080 (254, 9)	3.09302 (254, 9)	2.43227 (254, 9)	1.95423 (254, 9)	1.60228 (254, 9)
202.5 /	4.45675 (83, 5)	3.46363 (83, 5)	2.73528 (83, 5)	2.20559 (83, 5)	1.81406 (83, 5)
180.0 /	3.48075 (242,16)	2.67661 (242,16)	2.09523 (242,16)	1.70339 (242,20)	1.66517 (92, 3)
157.5 /	3.20409 (19, 4)	2.40733 (19, 4)	1.86276 (19, 4)	1.48203 (19, 4)	1.27116 (268, 6)
135.0 /	2.56576 (96,13)	1.91103 (96,13)	1.46782 (96,13)	1.72890 (250,22)	1.86903 (250,22)
112.5 /	2.52856 (84,17)	1.87186 (84,17)	1.43579 (84,17)	1.33355 (84,20)	1.35883 (84,20)
90.0 /	2.32567 (6,16)	1.71626 (6,16)	1.31289 (6,16)	1.48013 (185, 3)	1.54660 (185, 3)
67.5 /	4.44152 (37,23)	3.45529 (37,23)	2.73035 (37,23)	2.20248 (37,23)	1.81200 (37,23)
45.0 /	1.91165 (264,11)	1.39802 (264,11)	1.38519 (166, 5)	1.48384 (187,24)	1.54995 (187,24)
22.5 /	4.00162 (263, 3)	3.09346 (263, 3)	2.43253 (263, 3)	1.95439 (263, 3)	1.60239 (263, 3)
360.0 /	4.42781 (324, 7)	3.60577 (324, 7)	3.04848 (324, 7)	2.64539 (324, 7)	2.33981 (324, 7)

HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	1.96863	(202,10)	50.5	22.5	3.27310	(163, 9)
79.1	45.0	5.82876	(251, 9)	62.9	67.5	4.62110	(26,10)
586.0	90.0	1.36033	(6,16)	786.0	112.5	1.35830	(84,20)
772.0	135.0	1.83821	(250,22)	743.0	157.5	1.35344	(19, 4)
800.0	180.0	1.66517	(92, 3)	829.0	202.5	1.71992	(83, 5)
857.0	225.0	1.44252	(254, 9)	657.0	247.5	2.13718	(287, 7)
329.0	270.0	4.79130	(242,19)	117.2	292.5	5.92513	(243, 8)
46.7	315.0	2.79215	(219,10)	40.0	337.5	1.88744	(159, 9)
1157.0	118.5	0.94021	(195, 1)	1543.0	134.5	1.42005	(250,22)

2ND HIGH
1-HR
SGROUP# 1

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 5.73501 AND OCCURRED AT (200.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 25.0	50.0	100.0	200.0	300.0
337.5 /	0.12002 (163,10)	2.91206 (219,11)	4.78308 (173,19)	4.91737 (113,18)	4.01904 (113,18)
315.0 /	0.14193 (173,11)	3.03479 (155, 9)	4.41962 (178, 7)	4.86920 (37,24)	3.99893 (37,24)
292.5 /	0.13487 (224,11)	3.08549 (212,10)	5.10120 (150, 8)	4.67500 (178, 2)	3.51382 (18,15)
270.0 /	0.14697 (154,13)	3.05858 (281,11)	3.72547 (188,17)	4.35044 (186, 9)	3.69464 (83, 9)
247.5 /	0.13272 (154,11)	3.03975 (207, 8)	4.13549 (232, 8)	4.29331 (303,21)	3.71437 (186,19)
225.0 /	0.08086 (218, 8)	2.70091 (282,11)	5.00001 (3,14)	5.32136 (186,17)	4.48390 (264,12)
202.5 /	0.37796 (198,12)	3.10565 (198,11)	3.23910 (225, 8)	4.31944 (83, 4)	3.69148 (83, 6)
180.0 /	0.50802 (198,11)	3.62959 (198,12)	4.95686 (237,10)	4.59010 (9, 6)	3.71436 (242,17)
157.5 /	0.12846 (170,11)	2.75726 (292,13)	4.41329 (292,13)	4.03220 (145,10)	2.94243 (145,10)
135.0 /	0.13503 (220,11)	3.28066 (202, 9)	4.12038 (323,11)	3.28352 (3,12)	2.37153 (3,12)
112.5 /	0.15111 (188,10)	2.88085 (74,12)	3.96893 (202, 6)	4.60554 (3,13)	3.52016 (3,13)
90.0 /	0.14366 (138,12)	3.04524 (292,12)	5.13409 (307, 8)	4.03740 (194, 5)	2.94434 (194, 5)
67.5 /	0.33846 (125,12)	3.23691 (172, 9)	4.62143 (26,11)	5.29601 (159, 6)	4.35125 (159, 6)
45.0 /	0.26219 (194,12)	2.98589 (270,10)	4.57145 (264,10)	3.64619 (271, 7)	2.59226 (271, 7)
22.5 /	0.11164 (195,13)	2.92180 (195,13)	3.95992 (155, 7)	5.27629 (355,13)	4.46122 (324,21)
360.0 /	0.13381 (202,10)	2.87938 (202,10)	5.02517 (346, 8)	5.73501 (187, 5)	5.53618 (187, 5)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE RECEPTOR GRID *

* MAXIMUM VALUE EQUALS 5.73501 AND OCCURRED AT (200.0, 360.0) *

DIRECTION / (DEGREES) /	RANGE (METERS) 400.0	500.0	600.0	700.0	800.0
337.5 /	2.95464 (113,18)	2.21123 (113,18)	1.70562 (113,18)	1.35337 (113,18)	1.19181 (230,19)
315.0 /	2.94525 (37,24)	2.20630 (37,24)	1.70278 (37,24)	1.73145 (178,24)	1.75923 (178, 6)
292.5 /	2.52547 (18,15)	1.87026 (18,15)	1.43487 (18,15)	1.31253 (185,24)	1.36659 (185,24)
270.0 /	2.85174 (83, 9)	2.17908 (83, 9)	1.69603 (83, 9)	1.55029 (102, 5)	1.60247 (242,19)
247.5 /	2.86148 (186,19)	2.18431 (186,19)	1.69908 (186,19)	1.35210 (186,19)	1.37914 (158, 2)
225.0 /	3.48344 (264,12)	2.67807 (264,12)	2.09607 (264,12)	1.67719 (264,12)	1.37237 (175, 1)
202.5 /	2.85018 (83, 6)	2.17823 (83, 6)	1.69554 (83, 6)	1.53809 (174,23)	1.66034 (174,23)
180.0 /	2.86146 (242,17)	2.18430 (242,17)	1.69907 (242,17)	1.67667 (242,16)	1.64909 (242,20)
157.5 /	2.21780 (95,19)	1.67813 (95,19)	1.39948 (232, 5)	1.35152 (268, 6)	1.20753 (19, 4)
135.0 /	1.65892 (3,12)	1.20766 (3,12)	1.42464 (250,22)	1.16026 (96,13)	1.06247 (57,23)
112.5 /	2.52835 (3,13)	1.87175 (3,13)	1.43573 (3,13)	1.13589 (84,17)	1.01009 (183, 5)
90.0 /	2.07807 (194, 5)	1.52458 (194, 5)	1.28124 (185, 3)	1.09170 (6,17)	1.04792 (265,20)
67.5 /	3.21151 (159, 6)	2.41123 (159, 6)	1.86501 (159, 6)	1.48342 (159, 6)	1.39253 (6,19)
45.0 /	1.81363 (271, 7)	1.34195 (166, 5)	1.28508 (187,24)	1.34484 (166, 5)	1.33284 (187,22)
22.5 /	3.47215 (324,21)	2.67195 (324,21)	2.09248 (324,21)	1.67495 (324,21)	1.37764 (150,24)
360.0 /	4.34825 (187, 5)	3.37256 (187, 5)	2.65945 (187, 5)	2.14195 (187, 5)	1.76002 (187, 5)

*** WOBURN - EAST HIDE PILE - CASE #1 ***

* SECOND HIGHEST 1-HOUR AVERAGE CONCENTRATION (MICROGRAMS PER CUBIC METER) *
* FROM ALL SOURCES *
* FOR THE DISCRETE RECEPTOR POINTS *

- RNG -	- DIR -	CON.	(DAY,HOUR)	- RNG -	- DIR -	CON.	(DAY,HOUR)
41.0	360.0	1.91565	(194,15)	50.5	22.5	2.96262	(195,13)
79.1	45.0	4.19082	(327,11)	62.9	67.5	4.34694	(26,11)
586.0	90.0	1.24411	(185, 3)	786.0	112.5	1.02059	(183, 5)
772.0	135.0	1.06829	(57,23)	743.0	157.5	1.31985	(268, 6)
800.0	180.0	1.64909	(242,20)	829.0	202.5	1.68256	(174,23)
857.0	225.0	1.38002	(175, 1)	657.0	247.5	1.48757	(186,19)
329.0	270.0	3.44557	(83, 9)	117.2	292.5	5.11546	(150, 8)
46.7	315.0	2.71159	(155, 9)	40.0	337.5	1.78341	(252,11)
1157.0	118.5	0.88430	(203, 2)	1543.0	134.5	0.81257	(57,24)

COMPLEX - 1970

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COMPLEX-1 (DATED 86064)
AN AIR QUALITY DISPERSION MODEL IN
SECTION 4. ADDITIONAL MODELS FOR REGULATORY USE
IN UNAMAP (VERSION 6) JULY 86.
SOURCE: FILE 31 ON UNAMAP MAGNETIC TAPE FORM NTIS.


                         COMPLEX I  - VERSION 86064
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

                   GENERAL INPUT INFORMATION

 THIS RUN OF COMPLEX I -VERSION 86064 IS FOR THE POLLUTANT S02  FOR 8760   1-HOUR PERIODS.
 CONCENTRATION ESTIMATES BEGIN ON HOUR- 1,JULIAN DAY-  1, YEAR-1970.
 A FACTOR OF      0.0010000 HAS BEEN SPECIFIED TO CONVERT USER LENGTH UNITS TO KILOMETERS.
  1 SIGNIFICANT SOURCES ARE TO BE CONSIDERED.
THIS RUN WILL NOT CONSIDER ANY POLLUTANT LOSS.
 HIGH-FIVE SUMMARY CONCENTRATION TABLES WILL BE OUTPUT FOR   4 AVERAGING PERIODS.
 AVG TIMES OF 1,3,8, AND 24 HOURS ARE AUTOMATICALLY DISPLAYED.
  A FACTOR OF      0.3048000 HAS BEEN SPECIFIED TO CONVERT USER HEIGHT UNITS TO METERS.

 OPTION       OPTION LIST                  OPTION SPECIFICATION : 0= IGNORE OPTION
                                                                  1= USE OPTION
                       TECHNICAL OPTIONS
      1       TERRAIN ADJUSTMENTS                                  1
      2       DO NOT INCLUDE STACK DOWNWASH CALCULATIONS           0
      3       DO NOT INCLUDE GRADUAL PLUME RISE CALCULATIONS       1
      4       CALCULATE INITIAL PLUME SIZE                         1
                       INPUT OPTIONS
      5       READ MET DATA FROM CARDS                             0
      6       READ HOURLY EMISSIONS                                0
      7       SPECIFY SIGNIFICANT SOURCES                          0
      8       READ RADIAL DISTANCES TO GENERATE RECEPTORS          1
                       PRINTED OUTPUT OPTIONS
      9       DELETE EMISSIONS WITH HEIGHT TABLE                   1
     10       DELETE MET DATA SUMMARY FOR AVG PERIOD               1
     11       DELETE HOURLY CONTRIBUTIONS                          1
     12       DELETE MET DATA ON HOURLY CONTRIBUTIONS              1
     13       DELETE FINAL PLUME RISE CALC ON HRLY CONTRIBUTIONS   1
     14       DELETE HOURLY SUMMARY                                1
     15       DELETE MET DATA ON HRLY SUMMARY                      1
     16       DELETE FINAL PLUME RISE CALC ON HRLY SUMMARY         1
     17       DELETE AVG-PERIOD CONTRIBUTIONS                      1
     18       DELETE AVERAGING PERIOD SUMMARY                      1
     19       DELETE AVG CONCENTRATIONS AND HI-5 TABLES            0
                       OTHER CONTROL AND OUTPUT OPTIONS
     20       RUN IS PART OF A SEGMENTED RUN                       0
     21       WRITE PARTIAL CONC TO DISK OR TAPE                   0
     22       WRITE HOURLY CONC TO DISK OR TAPE                    0
     23       WRITE AVG-PERIOD CONC TO DISK OR TAPE                0
     24       PUNCH AVG-PERIOD CONC ONTO CARDS                     0
     25       COMPLEX TERRAIN OPTION                               1
     26       CALM PROCESSING OPTION                               0
     27       VALLEY SCREENING OPTION                              0

ANEMOMETER HEIGHT IS:      10.00
EXPONENTS FOR POWER- LAW WIND INCREASE WITH HEIGHT ARE:0.07,0.07,0.10,0.15,0.35,0.55
```

TERRAIN ADJUSTMENTS ARE: 0.500,0.500,0.500,0.500,0.000,0.000 ZMIN IS 10.0

POINT SOURCE INFORMATION

SOURCE	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	SO2(G/SEC) EMISSIONS	PART(G/SEC) EMISSIONS	STACK HT(M)	STACK TEMP(K)	STACK DIAM(M)	STACK VEL(M/SEC)	POTEN. IMPACT (MICRO G/M**3)	EFF HT(M)	GRD-LVL ELEV USER HT UNITS	BUOY FLUX F M**4/S**3
1 FLARE STACK	0.00	0.00	0.01	0.00	10.0	999.0	0.5	0.4	3.08	11.79	108.00	0.16

SIGNIFICANT SO2 POINT SOURCES

RANK	CHI-MAX (MICROGRAMS/M**3)	SOURCE NO.
1	3.08	1

ADDITIONAL INFORMATION ON SOURCES.

EMISSION INFORMATION FOR 1 (NPT) POINT SOURCES HAS BEEN INPUT
1 SIGNIFICANT POINT SOURCES(NSIGP) ARE TO BE USED FOR THIS RUN
THE ORDER OF SIGNIFICANCE(IMPS) FOR 25 OR LESS POINT SOURCES USED IN THIS RUN AS LISTED BY POINT SOURCE NUMBER:
1
SURFACE MET DATA FROM STATION(ISFCD) 14739, YEAR(ISFCYR) 1970
MIXING HEIGHT DATA FROM STATION(IMXD) 14764, YEAR(IMXYR) 1970

RECEPTOR INFORMATION

COMPLEX I INTERNALLY GENERATES 36 RECEPTORS ON A CIRCLE CORRESPONDING TO EACH NON-ZERO RADIAL DISTANCE FROM A CENTER POINT
COORDINATES ARE (USER UNITS): (0.000, 0.000)
RADIAL DISTANCE(S) USER SPECIFIED (USER UNITS): 50.000 100.000 0.000 0.000 0.000

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)
1	10,0050	8.682	49.240	0.0	115.0
2	20,0050	17.101	46.985	0.0	119.0
3	30,0050	25.000	43.301	0.0	122.0
4	40,0050	32.139	38.302	0.0	125.0
5	50,0050	38.302	32.139	0.0	127.0
6	60,0050	43.301	25.000	0.0	129.0
7	70,0050	46.985	17.101	0.0	128.0
8	80,0050	49.240	8.682	0.0	126.0
9	90,0050	50.000	0.000	0.0	123.0
10	100,0050	49.240	-8.682	0.0	121.0
11	110,0050	46.985	-17.101	0.0	116.0
12	120,0050	43.301	-25.000	0.0	118.0
13	130,0050	38.302	-32.139	0.0	117.0
14	140,0050	32.139	-38.302	0.0	113.0
15	150,0050	25.000	-43.301	0.0	106.0
16	160,0050	17.101	-46.985	0.0	108.0
17	170,0050	8.682	-49.240	0.0	102.0
18	180,0050	0.000	-50.000	0.0	99.0
19	190,0050	-8.682	-49.240	0.0	102.0
20	200,0050	-17.101	-46.985	0.0	108.0
21	210,0050	-25.000	-43.301	0.0	110.0
22	220,0050	-32.139	-38.302	0.0	112.0
23	230,0050	-38.302	-32.139	0.0	113.0
24	240,0050	-43.301	-25.000	0.0	115.0
25	250,0050	-46.985	-17.101	0.0	115.0

26	260,0050	-49.240	-8.682	0.0	113.0
27	270,0050	-50.000	0.000	0.0	110.0
28	280,0050	-49.240	8.682	0.0	105.0
29	290,0050	-46.985	17.101	0.0	103.0
30	300,0050	-43.301	25.000	0.0	97.0
31	310,0050	-38.302	32.139	0.0	92.0
32	320,0050	-32.139	38.302	0.0	96.0
33	330,0050	-25.000	43.301	0.0	103.0
34	340,0050	-17.101	46.985	0.0	108.0
35	350,0050	-8.682	49.240	0.0	111.0
36	360,0050	0.000	50.000	0.0	113.0
37	10,0100	17.365	98.481	0.0	108.0
38	20,0100	34.202	93.969	0.0	113.0
39	30,0100	50.000	86.603	0.0	120.0
40	40,0100	64.279	76.604	0.0	124.0
41	50,0100	76.604	64.279	0.0	128.0
42	60,0100	86.603	50.000	0.0	128.0
43	70,0100	93.969	34.202	0.0	128.0
44	80,0100	98.481	17.365	0.0	127.0
45	90,0100	100.000	0.000	0.0	130.0
46	100,0100	98.481	-17.365	0.0	125.0
47	110,0100	93.969	-34.202	0.0	120.0
48	120,0100	86.603	-50.000	0.0	117.0
49	130,0100	76.604	-64.279	0.0	113.0
50	140,0100	64.279	-76.604	0.0	111.0
51	150,0100	50.000	-86.603	0.0	111.0
52	160,0100	34.202	-93.969	0.0	107.0
53	170,0100	17.365	-98.481	0.0	88.0
54	180,0100	0.000	-100.000	0.0	84.0
55	190,0100	-17.365	-98.481	0.0	82.0
56	200,0100	-34.202	-93.969	0.0	82.0
57	210,0100	-50.000	-86.603	0.0	82.0
58	220,0100	-64.279	-76.604	0.0	84.0
59	230,0100	-76.604	-64.279	0.0	96.0
60	240,0100	-86.602	-50.000	0.0	108.0
61	250,0100	-93.969	-34.202	0.0	111.0
62	260,0100	-98.481	-17.365	0.0	106.0
63	270,0100	-100.000	0.000	0.0	98.0
64	280,0100	-98.481	17.365	0.0	88.0
65	290,0100	-93.969	34.202	0.0	76.0
66	300,0100	-86.603	50.000	0.0	76.0
67	310,0100	-76.605	64.279	0.0	80.0
68	320,0100	-64.279	76.604	0.0	85.0
69	330,0100	-50.000	86.602	0.0	87.0
70	340,0100	-34.202	93.969	0.0	97.0
71	350,0100	-17.365	98.481	0.0	106.0
72	360,0100	0.000	100.000	0.0	110.0
73	FENC22.5	19.330	46.660	0.0	120.0
74	FENC45.0	55.930	55.930	0.0	126.0
75	FENC67.5	58.110	24.070	0.0	130.0
76	FEN292.5	-108.280	44.850	0.0	74.0
77	FEN315.0	-33.020	33.020	0.0	94.0
78	FEN337.5	-15.310	36.960	0.0	112.0
79	FEN360.0	0.000	41.000	0.0	116.0

RECEPTORS

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)	DAY	AVG CONC FOR PERIOD 1.HR 1. TO DAY365.HR24. (MICROGRAMS/M**3)
1	10,0050	8.68	49.24	0.0	115.0		0.02
2	20,0050	17.10	46.98	0.0	119.0		0.02
3	30,0050	25.00	43.30	0.0	122.0		0.01
4	40,0050	32.14	38.30	0.0	125.0		0.02
5	50,0050	38.30	32.14	0.0	127.0		0.03
6	60,0050	43.30	25.00	0.0	129.0		0.04
7	70,0050	46.98	17.10	0.0	128.0		0.04
8	80,0050	49.24	8.68	0.0	126.0		0.03
9	90,0050	50.00	0.00	0.0	123.0		0.03
10	100,0050	49.24	-8.68	0.0	121.0		0.02
11	110,0050	46.98	-17.10	0.0	116.0		0.01
12	120,0050	43.30	-25.00	0.0	118.0		0.02
13	130,0050	38.30	-32.14	0.0	117.0		0.02
14	140,0050	32.14	-38.30	0.0	113.0		0.01
15	150,0050	25.00	-43.30	0.0	106.0		0.01
16	160,0050	17.10	-46.98	0.0	108.0		0.01
17	170,0050	8.68	-49.24	0.0	102.0		0.00
18	180,0050	0.00	-50.00	0.0	99.0		0.00
19	190,0050	-8.68	-49.24	0.0	102.0		0.01
20	200,0050	-17.10	-46.98	0.0	108.0		0.01
21	210,0050	-25.00	-43.30	0.0	110.0		0.01
22	220,0050	-32.14	-38.30	0.0	112.0		0.01
23	230,0050	-38.30	-32.14	0.0	113.0		0.01
24	240,0050	-43.30	-25.00	0.0	115.0		0.01
25	250,0050	-46.98	-17.10	0.0	115.0		0.02
26	260,0050	-49.24	-8.68	0.0	113.0		0.02
27	270,0050	-50.00	0.00	0.0	110.0		0.02
28	280,0050	-49.24	8.68	0.0	105.0		0.02
29	290,0050	-46.98	17.10	0.0	103.0		0.02
30	300,0050	-43.30	25.00	0.0	97.0		0.01
31	310,0050	-38.30	32.14	0.0	92.0		0.01
32	320,0050	-32.14	38.30	0.0	96.0		0.02
33	330,0050	-25.00	43.30	0.0	103.0		0.01
34	340,0050	-17.10	46.98	0.0	108.0		0.01
35	350,0050	-8.68	49.24	0.0	111.0		0.01
36	360,0050	0.00	50.00	0.0	113.0		0.02
37	10,0100	17.36	98.48	0.0	108.0		0.07
38	20,0100	34.20	93.97	0.0	113.0		0.07
39	30,0100	50.00	86.60	0.0	120.0		0.06
40	40,0100	64.28	76.60	0.0	124.0		0.06
41	50,0100	76.60	64.28	0.0	128.0		0.09
42	60,0100	86.60	50.00	0.0	128.0		* 0.10
43	70,0100	93.97	34.20	0.0	128.0		0.10
44	80,0100	98.48	17.36	0.0	127.0		0.07
45	90,0100	100.00	0.00	0.0	130.0		0.07
46	100,0100	98.48	-17.36	0.0	125.0		0.08
47	110,0100	93.97	-34.20	0.0	120.0		0.08
48	120,0100	86.60	-50.00	0.0	117.0		0.09
49	130,0100	76.60	-64.28	0.0	113.0		0.09
50	140,0100	64.28	-76.60	0.0	111.0		0.07
51	150,0100	50.00	-86.60	0.0	111.0		0.06
52	160,0100	34.20	-93.97	0.0	107.0		0.04
53	170,0100	17.36	-98.48	0.0	88.0		0.02
54	180,0100	0.00	-100.00	0.0	84.0		0.01

55	190,0100	-17.36	-98.48	0.0	82.0	0.01
56	200,0100	-34.20	-93.97	0.0	82.0	0.01
57	210,0100	-50.00	-86.60	0.0	82.0	0.01
58	220,0100	-64.28	-76.60	0.0	84.0	0.01
59	230,0100	-76.60	-64.28	0.0	96.0	0.02
60	240,0100	-86.60	-50.00	0.0	108.0	0.04
61	250,0100	-93.97	-34.20	0.0	111.0	0.06
62	260,0100	-98.48	-17.36	0.0	106.0	0.06
63	270,0100	-100.00	0.00	0.0	98.0	0.04
64	280,0100	-98.48	17.36	0.0	88.0	0.03
65	290,0100	-93.97	34.20	0.0	76.0	0.02
66	300,0100	-86.60	50.00	0.0	76.0	0.02
67	310,0100	-76.60	64.28	0.0	80.0	0.03
68	320,0100	-64.28	76.60	0.0	85.0	0.03
69	330,0100	-50.00	86.60	0.0	87.0	0.02
70	340,0100	-34.20	93.97	0.0	97.0	0.02
71	350,0100	-17.36	98.48	0.0	106.0	0.04
72	360,0100	0.00	100.00	0.0	110.0	0.06
73	FENC22.5	19.33	46.66	0.0	120.0	0.02
74	FENC45.0	55.93	55.93	0.0	126.0	0.05
75	FENC67.5	58.11	24.07	0.0	130.0	0.06
76	FEN292.5	-108.28	44.85	0.0	74.0	0.03
77	FEN315.0	-33.02	33.02	0.0	94.0	0.01
78	FEN337.5	-15.31	36.96	0.0	112.0	0.01
79	FEN360.0	0.00	41.00	0.0	116.0	0.01

FIVE HIGHEST 1-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR		1	2	3	4	5
1(8.68, 49.24)		10.99 (159,11)	10.87 (130, 8)	9.88 (150,10)	6.44 (175, 8)	6.41 (118,10)
2(17.10, 46.98)		12.57 (130, 8)	12.46 (159,11)	10.60 (152,13)	7.85 (221, 8)	7.75 (130, 7)
3(25.00, 43.30)		10.60 (152,13)	9.12 (221, 8)	8.96 (91,14)	8.93 (87, 9)	7.27 (16,14)
4(32.14, 38.30)		9.76 (36,10)	9.75 (87, 8)	8.88 (286,12)	8.57 (16,14)	5.71 (209,10)
5(38.30, 32.14)		9.88 (286,12)	9.82 (174, 6)	9.78 (118, 8)	9.76 (36,10)	9.75 (87, 8)
6(43.30, 25.00)	*	14.17 (159,10)	11.00 (229,15)	10.89 (174, 6)	10.85 (118, 8)	10.80 (165, 6)
7(46.98, 17.10)		14.17 (159,10)	10.61 (165,12)	10.45 (229,15)	10.26 (165, 6)	10.24 (133, 8)
8(49.24, 8.68)		9.75 (39,10)	9.75 (77,10)	9.75 (104, 8)	9.75 (103, 9)	9.74 (279, 9)
9(50.00, 0.00)		9.61 (214, 9)	9.45 (279, 9)	9.44 (103, 9)	9.42 (104, 8)	9.37 (77,10)
10(49.24, -8.68)		8.54 (303,10)	8.48 (77, 9)	7.21 (130,10)	7.21 (210, 8)	6.98 (281, 9)
11(46.98, -17.10)		8.45 (152,12)	6.77 (130,10)	6.60 (303,10)	5.71 (188, 9)	5.71 (227, 9)
12(43.30, -25.00)		8.45 (152,12)	7.50 (226, 9)	7.49 (206, 8)	7.43 (174, 8)	7.34 (279, 8)
13(38.30, -32.14)		7.12 (226, 9)	7.11 (206, 8)	7.06 (174, 8)	7.02 (148, 9)	6.99 (140, 8)
14(32.14, -38.30)		5.66 (148, 9)	5.63 (140, 8)	5.61 (135, 6)	5.48 (20,11)	4.75 (60,11)
15(25.00, -43.30)		8.11 (174,11)	3.84 (148, 8)	3.77 (129, 9)	3.75 (140, 8)	3.74 (135, 6)
16(17.10, -46.98)		8.71 (174,11)	4.27 (148, 8)	4.25 (129, 9)	3.78 (236,13)	3.18 (133, 9)
17(8.68, -49.24)		3.13 (179, 8)	3.10 (205, 8)	2.92 (278,12)	2.90 (293, 9)	2.88 (38,11)
18(0.00, -50.00)		2.61 (179, 8)	2.60 (205, 8)	2.59 (218, 8)	2.46 (278,12)	2.44 (60,12)
19(-8.68, -49.24)		3.13 (179, 8)	3.09 (218, 8)	3.08 (144, 9)	2.97 (174, 9)	2.94 (255, 8)
20(-17.10, -46.98)		8.41 (174,10)	4.31 (220, 9)	4.29 (144, 9)	4.29 (174, 9)	4.25 (78,11)
21(-25.00, -43.30)		9.10 (174,10)	4.94 (179, 9)	4.83 (204, 9)	4.78 (220, 9)	4.77 (255, 8)
22(-32.14, -38.30)		9.82 (140,12)	5.50 (179, 9)	5.42 (204, 9)	5.34 (140, 9)	5.33 (165, 7)
23(-38.30, -32.14)		10.19 (140,12)	10.09 (165, 8)	5.64 (165, 7)	5.53 (27,15)	5.46 (89,12)
24(-43.30, -25.00)		10.98 (140,12)	10.87 (165, 8)	6.44 (234,10)	6.36 (222, 8)	6.18 (27,15)
25(-46.98, -17.10)		6.44 (234,10)	6.42 (144,10)	6.36 (222, 8)	6.29 (315,14)	6.24 (79,15)
26(-49.24, -8.68)		5.81 (130,13)	5.80 (144,10)	5.64 (315,14)	5.59 (79,15)	5.58 (110, 7)
27(-50.00, 0.00)		7.60 (130,12)	7.57 (155,13)	4.96 (130,13)	4.95 (144,10)	4.72 (79,15)
28(-49.24, 8.68)		7.77 (140,11)	6.49 (130,12)	6.47 (155,13)	3.77 (221, 9)	3.74 (255, 9)
29([illegible]5.98, 17.10)		7.22 (140,11)	6.07 (130,12)	6.05 ([illegible]5,13)	3.35 (221, 9)	3.33 (255, 9)

30(-43.30, 25.00)	4.93 (159,13)	4.92 (118,11)	2.31 (165,14)	2.30 (206, 9)	2.30 (140,10)
31(-38.30, 32.14)	4.09 (159,12)	4.09 (159,13)	4.09 (118,11)	4.09 (165,13)	1.68 (205, 9)
32(-32.14, 38.30)	5.53 (130,11)	4.77 (227,11)	4.75 (159,12)	4.75 (165,13)	2.18 (205, 9)
33(-25.00, 43.30)	7.25 (130,11)	6.71 (165,11)	6.10 (227,11)	6.07 (165,13)	3.26 (263,10)
34(-17.10, 46.98)	7.95 (165,11)	7.16 (188,12)	4.40 (293,11)	4.29 (281,10)	4.28 (263, 9)
35(-8.68, 49.24)	8.74 (150,10)	7.84 (188,12)	5.18 (293,11)	5.02 (130, 6)	5.02 (303,11)
36(0.00, 50.00)	10.30 (159,11)	9.30 (150,10)	8.32 (188,12)	5.81 (175, 8)	5.79 (118,10)
37(17.36, 98.48)	8.56 (130, 8)	7.67 (130, 9)	7.65 (180, 7)	7.56 (66, 8)	6.39 (159,11)
38(34.20, 93.97)	9.03 (130, 8)	8.39 (180, 7)	6.86 (221, 8)	6.83 (130, 7)	6.83 (150, 6)
39(50.00, 86.60)	9.37 (16,14)	7.61 (221, 8)	7.57 (91,14)	7.56 (87, 9)	6.85 (222, 5)
40(64.28, 76.60)	10.12 (286,12)	10.00 (16,14)	7.97 (87, 8)	7.96 (36,10)	7.79 (222, 5)
41(76.60, 64.28)	10.77 (305, 9)	10.76 (286,12)	10.74 (174, 6)	10.73 (55,11)	10.72 (118, 8)
42(86.60, 50.00)	10.77 (305, 9)	10.77 (229,15)	10.77 (305, 8)	10.74 (174, 6)	10.73 (55,11)
43(93.97, 34.20)	10.77 (229,15)	10.77 (305, 8)	10.73 (55,11)	10.71 (165, 6)	10.70 (133, 8)
44(98.48, 17.36)	10.60 (79, 8)	10.55 (165, 6)	10.46 (3,11)	7.97 (170,16)	7.97 (214, 9)
45(100.00, 0.00)	11.17 (281, 9)	11.09 (79, 8)	10.96 (330,10)	10.93 (3,11)	9.34 (220, 6)
46(98.48, -17.36)	10.35 (281, 9)	10.31 (140, 7)	10.17 (330,10)	8.05 (220, 6)	7.97 (303,10)
47(93.97, -34.20)	9.51 (140, 7)	9.42 (359,14)	7.57 (303,10)	6.48 (91, 6)	5.99 (130,10)
48(86.60, -50.00)	8.95 (359,14)	8.92 (60,14)	8.90 (28,10)	7.30 (226, 9)	7.30 (206, 8)
49(76.60, -64.28)	8.44 (255, 7)	8.33 (359,14)	8.31 (60,14)	8.29 (28,10)	6.87 (226, 9)
50(64.28, -76.60)	8.13 (255, 7)	6.63 (148, 9)	6.62 (140, 8)	6.61 (135, 6)	6.57 (20,11)
51(50.00, -86.60)	8.07 (133, 9)	6.63 (129, 9)	6.62 (140, 8)	6.61 (135, 6)	6.58 (174,11)
52(34.20, -93.97)	7.49 (133, 9)	6.33 (174,11)	6.21 (129, 9)	4.35 (116, 5)	4.34 (148, 8)
53(17.36, -98.48)	4.94 (20,12)	4.93 (12,10)	4.33 (293, 9)	4.32 (38,11)	3.69 (179, 8)
54(0.00,-100.00)	4.50 (20,12)	4.49 (12,10)	3.98 (293, 9)	3.97 (38,11)	3.96 (39, 9)
55(-17.36, -98.48)	4.35 (116, 7)	4.32 (49,13)	4.27 (12,10)	3.84 (174, 9)	3.82 (255, 8)
56(-34.20, -93.97)	6.18 (174,10)	4.35 (116, 7)	4.32 (49,13)	3.84 (174, 9)	3.82 (255, 8)
57(-50.00, -86.60)	6.18 (174,10)	3.84 (204, 9)	3.82 (255, 8)	3.82 (140, 9)	3.82 (165, 7)
58(-64.28, -76.60)	6.28 (140,12)	4.51 (28,11)	4.01 (204, 9)	3.99 (140, 9)	3.99 (165, 7)
59(-76.60, -64.28)	7.42 (165, 8)	7.35 (140,12)	5.93 (28,11)	5.09 (165, 7)	5.05 (27,15)
60(-86.60, -50.00)	8.56 (165, 8)	8.47 (140,12)	6.33 (222, 8)	6.27 (27,15)	5.24 (234,10)
61(-93.97, -34.20)	8.14 (132, 6)	6.64 (222, 8)	6.62 (315,14)	6.61 (79,15)	6.60 (110, 7)
62(-98.48, -17.36)	7.40 (132, 6)	6.10 (315,14)	6.08 (79,15)	6.08 (110, 7)	6.04 (20,13)
63(-100.00, 0.00)	5.27 (79,15)	5.27 (110, 7)	5.24 (20,13)	4.44 (130,13)	4.44 (144,10)
64(-98.48, 17.36)	5.14 (140,11)	3.70 (221, 9)	3.69 (255, 9)	3.45 (130,12)	3.45 (155,13)
65(-93.97, 34.20)	4.41 (140,11)	3.75 (180, 6)	3.35 (191,13)	3.33 (120, 7)	3.00 (130,12)
66(-86.60, 50.00)	3.76 (282, 9)	3.75 (180, 6)	3.35 (191,13)	3.33 (120, 7)	3.00 (159,13)
67(-76.60, 64.28)	4.16 (282, 9)	3.67 (221, 7)	3.15 (159,13)	3.15 (159,12)	3.15 (118,11)
68(-64.28, 76.60)	4.97 (130,11)	4.09 (221, 7)	4.08 (116, 9)	4.06 (39,11)	4.03 (36,11)
69(-50.00, 86.60)	5.09 (130,11)	4.87 (79, 9)	4.25 (116, 9)	4.24 (303,11)	4.23 (39,11)
70(-34.20, 93.97)	6.15 (286,13)	6.09 (79, 9)	5.18 (303,11)	5.18 (130, 6)	4.57 (165,11)
71(-17.36, 98.48)	7.38 (286,13)	7.27 (66, 8)	6.09 (130, 6)	6.09 (303,11)	6.09 (305,10)
72(0.00, 100.00)	7.96 (130, 9)	7.94 (180, 7)	7.85 (66, 8)	6.51 (159,11)	6.51 (130, 7)
73(19.33, 46.66)	13.10 (130, 8)	10.58 (152,13)	8.36 (221, 8)	8.23 (150, 6)	8.21 (91,14)
74(55.93, 55.93)	12.01 (286,12)	11.96 (118, 8)	11.81 (16,14)	11.79 (3,10)	9.86 (36,10)
75(58.11, 24.07)	13.62 (229,15) *	13.52 (174, 6)	13.44 (165, 6)	13.43 (133, 8)	13.32 (305, 9)
76(-108.28, 44.85)	4.02 (282, 9)	3.99 (180, 6)	3.88 (140,11)	3.33 (191,13)	3.31 (120, 7)
77(-33.02, 33.02)	4.46 (130,11)	4.07 (227,11)	4.05 (159,12)	4.05 (118,11)	4.05 (165,13)
78(-15.31, 36.96)	7.87 (165,11)	3.45 (281,10)	3.44 (263, 9)	3.28 (293,11)	3.22 (91,12)
79(0.00, 41.00)	9.96 (159,11)	9.61 (150,10)	8.10 (188,12)	4.81 (175, 8)	4.78 (118,10)

FIVE HIGHEST 3-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	7.39 (130, 9)	4.34 (150,12)	3.66 (159,12)	3.01 (180, 9)	2.48 (125, 9)
2(17.10, 46.98)	6.77 (130, 9)	4.15 (159,12)	3.53 (152,15)	2.62 (221, 9)	2.58 (150, 6)
3(25.00, 43.30)	3.53 (152,15)	3.29 (91,15)	3.04 (221, 9)	3.00 (87, 9)	2.42 (16,15)
4(32.14, 38.30)	3.53 (286,12)	3.27 (87, 9)	3.25 (36,12)	2.86 (16,15)	1.90 (209,12)

5(38.30, 32.14)	4.31 (91,12)	4.00 (118, 9)	3.86 (286,12)	3.49 (160, 9)	3.27 (174, 6)
6(43.30, 25.00)	7.04 (305, 9)	6.00 (161, 9)	4.72 (159,12)	4.31 (91,12)	3.67 (229,15)
7(46.98, 17.10)	5.55 (159, 9)	4.81 (208, 9)	4.72 (159,12)	3.83 (152, 9)	3.60 (77,12)
8(49.24, 8.68)	5.20 (208, 9)	4.06 (79, 9)	3.99 (103, 9)	3.60 (77,12)	3.49 (66,12)
9(50.00, 0.00)	3.89 (103, 9)	3.78 (77,12)	3.52 (79, 9)	3.49 (66,12)	3.20 (214, 9)
10(49.24, -8.68)	2.90 (281, 9)	2.85 (303,12)	2.83 (77, 9)	2.40 (130,12)	2.40 (210, 9)
11(46.98, -17.10)	2.82 (152,12)	2.26 (130,12)	2.25 (227, 9)	2.20 (303,12)	1.90 (188, 9)
12(43.30, -25.00)	2.82 (152,12)	2.50 (226, 9)	2.50 (206, 9)	2.48 (174, 9)	2.46 (279, 9)
13(38.30, -32.14)	2.40 (147, 9)	2.37 (226, 9)	2.37 (206, 9)	2.35 (174, 9)	2.34 (148, 9)
14(32.14, -38.30)	2.40 (147, 9)	2.23 (20,12)	2.05 (135, 6)	1.98 (60,12)	1.89 (148, 9)
15(25.00, -43.30)	2.70 (174,12)	1.48 (60,12)	1.33 (135, 6)	1.28 (148, 9)	1.26 (129, 9)
16(17.10, -46.98)	2.90 (174,12)	1.42 (148, 9)	1.42 (129, 9)	1.26 (236,15)	1.06 (133, 9)
17(8.68, -49.24)	1.04 (179, 9)	1.03 (205, 9)	0.97 (278,12)	0.97 (293, 9)	0.96 (38,12)
18(0.00, -50.00)	0.87 (179, 9)	0.87 (205, 9)	0.86 (218, 9)	0.82 (278,12)	0.81 (60,12)
19(-8.68, -49.24)	1.04 (179, 9)	1.03 (218, 9)	1.03 (144, 9)	0.99 (174, 9)	0.98 (255, 9)
20(-17.10, -46.98)	2.80 (174,12)	1.44 (220, 9)	1.43 (144, 9)	1.43 (174, 9)	1.42 (78,12)
21(-25.00, -43.30)	3.03 (174,12)	2.24 (78,12)	1.98 (106, 9)	1.65 (179, 9)	1.61 (204, 9)
22(-32.14, -38.30)	3.27 (140,12)	2.35 (89,12)	2.25 (106, 9)	1.83 (179, 9)	1.81 (204, 9)
23(-38.30, -32.14)	5.24 (165, 9)	3.40 (140,12)	1.84 (27,15)	1.82 (89,12)	1.58 (271,15)
24(-43.30, -25.00)	3.66 (140,12)	3.62 (165, 9)	2.15 (234,12)	2.12 (222, 9)	2.06 (27,15)
25(-46.98, -17.10)	2.94 (139,15)	2.25 (240,12)	2.18 (124,12)	2.15 (234,12)	2.14 (144,12)
26(-49.24, -8.68)	2.94 (139,15)	2.19 (240,12)	2.11 (124,12)	2.00 (133,15)	1.94 (130,15)
27(-50.00, 0.00)	2.53 (120,12)	2.53 (130,12)	2.52 (155,15)	1.83 (104,12)	1.77 (97,15)
28(-49.24, 8.68)	2.59 (140,12)	2.40 (155,15)	2.26 (140,15)	2.16 (130,12)	2.08 (120,12)
29(-46.98, 17.10)	2.43 (155,15)	2.41 (140,12)	2.05 (116,12)	2.02 (130,12)	1.37 (107,12)
30(-43.30, 25.00)	1.86 (159,15)	1.64 (118,12)	1.46 (165,15)	1.46 (120, 9)	1.42 (163,15)
31(-38.30, 32.14)	2.43 (165,15)	1.90 (118,12)	1.49 (226,12)	1.48 (159,15)	1.46 (205,12)
32(-32.14, 38.30)	2.24 (165,15)	1.84 (130,12)	1.59 (227,12)	1.58 (159,12)	1.41 (282,12)
33(-25.00, 43.30)	2.42 (130,12)	2.24 (165,12)	2.12 (281,12)	2.03 (227,12)	2.02 (165,15)
34(-17.10, 46.98)	2.78 (281,12)	2.65 (165,12)	2.39 (188,12)	1.60 (211, 9)	1.47 (293,12)
35(-8.68, 49.24)	2.92 (180, 9)	2.91 (150,12)	2.61 (188,12)	1.73 (293,12)	1.67 (130, 6)
36(0.00, 50.00)	4.40 (180, 9)	3.43 (159,12)	3.35 (130, 9)	3.10 (150,12)	2.77 (188,12)
37(17.36, 98.48)	7.51 (130, 9)	3.67 (180, 9)	2.95 (285, 9)	2.90 (305,12)	2.69 (125, 9)
38(34.20, 93.97)	5.29 (130, 9)	2.99 (125, 9)	2.80 (180, 9)	2.56 (91,15)	2.29 (221, 9)
39(50.00, 86.60)	4.40 (56, 9)	3.32 (91,15)	3.26 (87, 9)	3.12 (16,15)	2.57 (227,15)
40(64.28, 76.60)	4.81 (286,12)	3.40 (87, 9)	3.33 (16,15)	2.65 (36,12)	2.60 (222, 6)
41(76.60, 64.28)	5.38 (118, 9)	5.02 (286,12)	4.31 (3,12)	4.12 (16,15)	4.07 (305, 9)
42(86.60, 50.00)	7.66 (305, 9)	5.55 (161, 9)	4.31 (3,12)	3.80 (159, 9)	3.59 (229,15)
43(93.97, 34.20)	5.80 (159, 9)	4.12 (3,15)	4.07 (305, 9)	3.99 (208, 9)	3.86 (55,12)
44(98.48, 17.36)	5.95 (79, 9)	5.02 (208, 9)	4.46 (103, 9)	3.56 (77,12)	3.52 (165, 6)
45(100.00, 0.00)	6.11 (79, 9)	5.16 (281, 9)	4.46 (103, 9)	4.36 (77,12)	3.65 (330,12)
46(98.48, -17.36)	4.89 (281, 9)	3.44 (140, 9)	3.39 (330,12)	2.68 (220, 6)	2.66 (303,12)
47(93.97, -34.20)	3.17 (140, 9)	3.14 (359,15)	2.88 (220, 9)	2.52 (303,12)	2.49 (227, 9)
48(86.60, -50.00)	3.20 (28, 9)	2.98 (359,15)	2.97 (60,15)	2.97 (28,12)	2.88 (263, 9)
49(76.60, -64.28)	3.43 (147, 9)	2.94 (28, 9)	2.90 (187, 9)	2.85 (19,12)	2.83 (234, 9)
50(64.28, -76.60)	3.86 (135, 6)	3.42 (147, 9)	3.21 (20,12)	2.85 (19,12)	2.80 (28, 9)
51(50.00, -86.60)	3.86 (135, 6)	2.96 (8,15)	2.69 (133, 9)	2.46 (144, 9)	2.35 (60,12)
52(34.20, -93.97)	2.50 (133, 9)	2.11 (174,12)	2.07 (129, 9)	1.56 (8,18)	1.45 (116, 6)
53(17.36, -98.48)	1.65 (20,12)	1.64 (12,12)	1.44 (293, 9)	1.44 (38,12)	1.24 (304, 9)
54(0.00, -100.00)	1.50 (20,12)	1.50 (12,12)	1.33 (293, 9)	1.32 (38,12)	1.32 (39, 9)
55(-17.36, -98.48)	1.45 (116, 9)	1.44 (49,15)	1.42 (12,12)	1.28 (174, 9)	1.27 (255, 9)
56(-34.20, -93.97)	2.06 (174,12)	1.45 (116, 9)	1.44 (49,15)	1.42 (330, 9)	1.28 (174, 9)
57(-50.00, -86.60)	2.06 (174,12)	1.76 (106, 9)	1.75 (78,12)	1.28 (204, 9)	1.27 (255, 9)
58(-64.28, -76.60)	2.09 (140,12)	1.86 (106, 9)	1.73 (89,12)	1.50 (28,12)	1.34 (204, 9)
59(-76.60, -64.28)	4.17 (165, 9)	2.45 (140,12)	1.98 (28,12)	1.93 (37, 9)	1.89 (124, 9)
60(-86.60, -50.00)	3.07 (221, 6)	2.85 (165, 9)	2.82 (140,12)	2.39 (27,15)	2.11 (222, 9)
61(-93.97, -34.20)	4.37 (132, 6)	2.74 (139,15)	2.44 (79,15)	2.44 (240,12)	2.25 (124,12)
62(-98.48, -17.36)	3.83 (132, 6)	2.70 (133,15)	2.59 (139,15)	2.52 (217,15)	2.34 (315,15)
63(-100.00, 0.00)	1.96 (155,12)	1.92 (97,15)	1.91 (20,15)	1.89 (110, 9)	1.88 (79,15)
6[illegible]([illegible]8.48, 17.36)	1.85 (140,15)	1.71 (140,12)	1.5[illegible] [illegible]55,15)	1.57 (135,12)	1.54 (120,12)

65(-93.97, 34.20)	1.58 (155,15)	1.47 (140,12)	1.47 (116,12)	1.25 (180, 6)	1.24 (107,12)
66(-86.60, 50.00)	2.07 (120, 9)	1.60 (165,15)	1.56 (159,15)	1.40 (132,12)	1.37 (163,15)
67(-76.60, 64.28)	2.79 (165,15)	1.99 (226,12)	1.90 (205,12)	1.90 (204,12)	1.84 (118,12)
68(-64.28, 76.60)	2.03 (282,12)	1.95 (39,12)	1.88 (165,15)	1.85 (36,12)	1.81 (263,12)
69(-50.00, 86.60)	1.94 (36,12)	1.94 (281,12)	1.70 (130,12)	1.62 (79, 9)	1.62 (188,12)
70(-34.20, 93.97)	2.31 (281,12)	2.05 (286,15)	2.03 (79, 9)	1.73 (303,12)	1.73 (130, 6)
71(-17.36, 98.48)	2.46 (286,15)	2.45 (191, 9)	2.42 (66, 9)	2.32 (180, 9)	2.03 (130, 6)
72(0.00, 100.00)	5.09 (180, 9)	4.82 (130, 9)	3.18 (285, 9)	2.97 (305,12)	2.77 (160, 6)
73(19.33, 46.66)	4.37 (130, 9)	3.53 (152,15)	2.79 (221, 9)	2.74 (150, 6)	2.74 (91,15)
74(55.93, 55.93)	5.75 (118, 9)	5.40 (286,12)	4.43 (91,12)	3.94 (16,15)	3.93 (3,12)
75(58.11, 24.07) *	8.94 (305, 9) *	6.91 (161, 9)	5.35 (208, 9)	4.56 (152, 9)	4.54 (229,15)
76(-108.28, 44.85)	2.02 (120, 9)	1.38 (282, 9)	1.38 (116,12)	1.33 (180, 6)	1.29 (140,12)
77(-33.02, 33.02)	2.32 (165,15)	1.84 (118,12)	1.49 (130,12)	1.37 (205,12)	1.36 (204,12)
78(-15.31, 36.96)	2.62 (165,12)	2.22 (281,12)	1.15 (263, 9)	1.09 (293,12)	1.07 (91,12)
79(0.00, 41.00)	3.32 (159,12)	3.20 (150,12)	3.01 (180, 9)	2.70 (188,12)	2.30 (130, 9)

FIVE HIGHEST 8-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	2.45 (150,16)	2.14 (130, 8)	1.60 (118,16)	1.37 (159,16)	1.13 (161,16)
2(17.10, 46.98)	2.54 (130, 8)	1.56 (159,16)	1.33 (152,16)	1.13 (161,16)	1.09 (91,16)
3(25.00, 43.30)	1.36 (91,16)	1.33 (152,16)	1.32 (87,16)	1.14 (221, 8)	0.94 (160,16)
4(32.14, 38.30)	1.33 (286,16)	1.23 (87, 8)	1.22 (36,16)	1.09 (160,16)	1.07 (16,16)
5(38.30, 32.14)	2.76 (3,16)	2.12 (91,16)	2.05 (161,16)	1.50 (118, 8)	1.45 (286,16)
6(43.30, 25.00)	2.67 (159,16) *	2.62 (3,16)	1.96 (161,16)	1.62 (91,16)	1.53 (161, 8)
7(46.98, 17.10)	2.67 (159,16)	1.81 (152,16)	1.81 (229,16)	1.66 (170,16)	1.61 (208,16)
8(49.24, 8.68)	1.75 (170,16)	1.61 (208,16)	1.52 (79, 8)	1.48 (77,16)	1.31 (66,16)
9(50.00, 0.00)	2.59 (77,16)	1.59 (66,16)	1.32 (79, 8)	1.20 (214,16)	1.18 (279,16)
10(49.24, -8.68)	1.18 (77,16)	1.07 (303,16)	0.90 (130,16)	0.90 (210, 8)	0.87 (281,16)
11(46.98, -17.10)	1.06 (152,16)	0.85 (130,16)	0.83 (303,16)	0.71 (188,16)	0.71 (227,16)
12(43.30, -25.00)	1.06 (152,16)	0.95 (359,16)	0.94 (226,16)	0.94 (206, 8)	0.93 (174, 8)
13(38.30, -32.14)	1.17 (147,16)	1.07 (20,16)	1.04 (359,16)	0.89 (226,16)	0.89 (206, 8)
14(32.14, -38.30)	1.03 (20,16)	0.77 (135, 8)	0.74 (60,16)	0.72 (147,16)	0.71 (148,16)
15(25.00, -43.30)	1.01 (174,16)	0.58 (148, 8)	0.55 (60,16)	0.53 (236,16)	0.50 (135, 8)
16(17.10, -46.98)	1.09 (174,16)	0.58 (236,16)	0.53 (148, 8)	0.53 (129,16)	0.40 (133,16)
17(8.68, -49.24)	0.39 (179, 8)	0.39 (205, 8)	0.37 (278,16)	0.36 (293,16)	0.36 (38,16)
18(0.00, -50.00)	0.33 (179, 8)	0.32 (205, 8)	0.32 (218, 8)	0.31 (278,16)	0.30 (60,16)
19(-8.68, -49.24)	0.71 ([illegible], 16)	0.55 (62,16)	0.43 (274,16)	0.39 (179, 8)	0.39 (218, 8)
20(-17.10, -46.98)	1.5[illegible] ([illegible])	0.97 (139,16)	0.63 (274,16)	0.54 (220,16)	0.54 (144,16)
21(-25.00, -43.30)	1.14 (174,16)	0.84 (78,16)	0.62 (179,16)	0.60 (204,16)	0.60 (220,16)
22(-32.14, -38.30)	1.90 (140,16)	0.88 (89,16)	0.69 (179,16)	0.68 (204,16)	0.67 (165, 8)
23(-38.30, -32.14)	1.97 (165, 8)	1.27 (140,16)	0.79 (271,16)	0.69 (27,16)	0.68 (89,16)
24(-43.30, -25.00)	1.37 (140,16)	1.36 (165, 8)	0.81 (234,16)	0.79 (222, 8)	0.77 (27,16)
25(-46.98, -17.10)	1.10 (139,16)	1.10 (120,16)	0.90 (79,16)	0.84 (240,16)	0.82 (124,16)
26(-49.24, -8.68)	1.41 (79,16)	1.22 (119,16)	1.10 (139,16)	1.10 (120,16)	0.93 (133,16)
27(-50.00, 0.00)	1.57 (130,16)	1.56 (155,16)	1.44 (119,16)	1.30 (135,16)	1.27 (149,16)
28(-49.24, 8.68)	1.82 (140,16)	1.44 (155,16)	1.08 (135,16)	1.05 (222,16)	0.99 (149,16)
29(-46.98, 17.10)	1.34 (140,16)	1.06 (155,16)	0.85 (116,16)	0.84 (206,16)	0.78 (255,16)
30(-43.30, 25.00)	0.85 (165,16)	0.74 (159,16)	0.72 (205,16)	0.62 (118,16)	0.55 (206,16)
31(-38.30, 32.14)	1.10 (165,16)	1.09 (159,16)	0.76 (205,16)	0.71 (118,16)	0.64 (204,16)
32(-32.14, 38.30)	1.35 (165,16)	0.69 (130,16)	0.60 (227,16)	0.59 (159,16)	0.58 (204,16)
33(-25.00, 43.30)	2.00 (165,16)	0.91 (130,16)	0.89 (263,16)	0.79 (281,16)	0.76 (227,16)
34(-17.10, 46.98)	1.04 (281,16)	0.99 (165,16)	0.89 (188,16)	0.55 (293,16)	0.54 (263,16)
35(-8.68, 49.24)	1.09 (150,16)	0.98 (188,16)	0.65 (293,16)	0.63 (130, 8)	0.63 (303,16)
36(0.00, 50.00)	1.96 (150,16)	1.29 (159,16)	1.15 (180, 8)	1.04 (188,16)	0.91 (175, 8)
37(17.36, 98.48)	1.93 (150,16)	1.86 (130, 8)	1.31 (228,16)	1.31 (118,16)	1.27 (326,16)
38(34.20, 93.97)	1.98 (130, 8)	1.32 (125, 8)	1.30 (91,16)	1.28 (326,16)	1.24 (87,16)
39(50.00, 8[illegible])	1.60 (87,16)	1.58 (91,16)	1.29 (16,16)	1.23 (160,16)	1.04 (227,16)

40(64.28, 76.60)	1.80 (286,16)	1.49 (273,16)	1.30 (153,16)	1.27 (87, 8)	1.25 (16,16)
41(76.60, 64.28) *	3.85 (3,16)	2.18 (118, 8)	1.88 (286,16)	1.77 (91,16)	1.55 (16,16)
42(86.60, 50.00)	2.94 (3,16)	2.06 (142,16)	1.98 (161, 8)	1.76 (118, 8)	1.66 (159,16)
43(93.97, 34.20)	2.15 (159, 8)	2.11 (77,16)	1.97 (161, 8)	1.77 (229,16)	1.66 (159,16)
44(98.48, 17.36)	2.23 (79, 8)	1.78 (77,16)	1.72 (170,16)	1.52 (3,16)	1.35 (208,16)
45(100.00, 0.00)	2.74 (77,16)	2.29 (79, 8)	1.95 (66,16)	1.40 (281,16)	1.37 (330,16)
46(98.48, -17.36)	1.55 (220, 8)	1.44 (140, 8)	1.30 (77,16)	1.29 (281,16)	1.27 (330,16)
47(93.97, -34.20)	1.93 (140, 8)	1.20 (112, 8)	1.18 (359,16)	1.16 (321,16)	1.08 (220, 8)
48(86.60, -50.00)	1.84 (359,16)	1.56 (28,16)	1.45 (60,16)	1.21 (19,16)	1.08 (263, 8)
49(76.60, -64.28)	2.10 (359,16)	1.49 (28,16)	1.42 (19,16)	1.39 (187,16)	1.38 (60,16)
50(64.28, -76.60)	1.70 (20,16)	1.45 (135, 8)	1.35 (19,16)	1.20 (255, 8)	1.04 (188, 8)
51(50.00, -86.60)	1.72 (8,16)	1.45 (135, 8)	1.12 (194, 8)	1.01 (133,16)	0.98 (140, 8)
52(34.20, -93.97)	1.06 (8,16)	0.94 (133,16)	0.79 (174,16)	0.78 (129,16)	0.75 (236,16)
53(17.36, -98.48)	0.62 (20,16)	0.62 (12,16)	0.54 (293,16)	0.54 (38,16)	0.46 (179, 8)
54(0.00,-100.00)	0.95 (12,16)	0.60 (62,16)	0.56 (20,16)	0.50 (293,16)	0.50 (38,16)
55(-17.36, -98.48)	0.88 (12,16)	0.70 (62,16)	0.58 (139,16)	0.57 (49,16)	0.54 (116, 8)
56(-34.20, -93.97)	1.25 (174,16)	0.75 (116, 8)	0.58 (139,16)	0.56 (49,16)	0.49 (106, 8)
57(-50.00, -86.60)	0.77 (174,16)	0.65 (78,16)	0.48 (204,16)	0.48 (255, 8)	0.48 (140,16)
58(-64.28, -76.60)	1.28 (140,16)	0.65 (89,16)	0.56 (28,16)	0.50 (204,16)	0.50 (165, 8)
59(-76.60, -64.28)	1.56 (165, 8)	0.92 (140,16)	0.74 (28,16)	0.72 (37,16)	0.71 (124, 8)
60(-86.60, -50.00)	1.15 (221, 8)	1.12 (37,16)	1.07 (165, 8)	1.06 (140,16)	0.90 (27,16)
61(-93.97, -34.20)	1.64 (132, 8)	1.34 (313,16)	1.27 (315,16)	1.21 (79,16)	1.21 (133,16)
62(-98.48, -17.36)	1.60 (79,16)	1.52 (133,16)	1.44 (132, 8)	1.35 (119,16)	1.30 (217,16)
63(-100.00, 0.00)	1.58 (119,16)	1.35 (135,16)	1.21 (155,16)	1.19 (149,16)	1.12 (79,16)
64(-98.48, 17.36)	1.34 (140,16)	1.15 (155,16)	1.09 (135,16)	1.05 (222,16)	0.92 (149,16)
65(-93.97, 34.20)	0.92 (140,16)	0.79 (155,16)	0.66 (116,16)	0.64 (206,16)	0.63 (255,16)
66(-86.60, 50.00)	0.96 (165,16)	0.78 (120, 8)	0.74 (282,16)	0.70 (159,16)	0.68 (132,16)
67(-76.60, 64.28)	1.31 (165,16)	1.24 (204,16)	1.21 (282,16)	1.17 (159,16)	1.10 (205,16)
68(-64.28, 76.60)	1.37 (165,16)	1.14 (39,16)	1.03 (204,16)	0.81 (225,16)	0.76 (282,16)
69(-50.00, 86.60)	1.33 (165,16)	0.93 (263,16)	0.75 (303,16)	0.75 (39,16)	0.73 (36,16)
70(-34.20, 93.97)	0.87 (281,16)	0.77 (286,16)	0.76 (79,16)	0.65 (303,16)	0.65 (130, 8)
71(-17.36, 98.48)	1.03 (275, 8)	0.93 (252,24)	0.92 (286,16)	0.91 (66, 8)	0.76 (130, 8)
72(0.00, 100.00)	1.64 (180, 8)	1.62 (150,16)	1.48 (273,16)	1.36 (285, 8)	1.22 (175, 8)
73(19.33, 46.66)	1.64 (130, 8)	1.32 (152,16)	1.16 (91,16)	1.13 (87,16)	1.04 (221, 8)
74(55.93, 55.93)	2.48 (91,16)	2.36 (3,16)	2.23 (118, 8)	2.03 (286,16)	1.48 (16,16)
75(58.11, 24.07)	2.58 (159,16)	2.27 (229,16)	2.03 (152,16)	1.95 (161, 8)	1.94 (161,16)
76(-108.28, 44.85)	0.85 (140,16)	0.84 (143,16)	0.78 (120, 8)	0.66 (116,16)	0.63 (206,16)
77(-33.02, 33.02)	1.23 (165,16)	0.70 (205,16)	0.69 (118,16)	0.58 (204,16)	0.56 (130,16)
78(-15.31, 36.96)	0.98 (165,16)	0.83 (281,16)	0.43 (263,16)	0.41 (293,16)	0.40 (91,16)
79(0.00, 41.00)	1.76 (150,16)	1.25 (159,16)	1.01 (188,16)	0.77 (180, 8)	0.69 (175, 8)

FIVE HIGHEST 24-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	1.08 (150,24)	0.92 (130,24)	0.53 (118,24)	0.48 (125,24)	0.46 (159,24)
2(17.10, 46.98)	0.85 (130,24)	0.52 (159,24)	0.46 (150,24)	0.44 (152,24)	0.38 (161,24)
3(25.00, 43.30)	0.46 (91,24)	0.44 (87,24)	0.44 (152,24)	0.38 (221,24)	0.32 (160,24)
4(32.14, 38.30)	0.44 (87,24)	0.44 (286,24)	0.41 (36,24)	0.37 (160,24)	0.36 (16,24)
5(38.30, 32.14)	0.92 (3,24)	0.74 (161,24)	0.71 (91,24)	0.50 (118,24)	0.49 (286,24)
6(43.30, 25.00)	1.16 (161,24)	0.99 (159,24)	0.89 (165,24)	0.88 (305,24)	0.87 (3,24)
7(46.98, 17.10) *	1.36 (159,24)	0.92 (152,24)	0.87 (165,24)	0.86 (161,24)	0.84 (208,24)
8(49.24, 8.68)	0.89 (208,24)	0.61 (152,24)	0.58 (170,24)	0.57 (77,24)	0.51 (79,24)
9(50.00, 0.00)	0.86 (77,24)	0.53 (66,24)	0.49 (103,24)	0.44 (79,24)	0.40 (214,24)
10(49.24, -8.68)	0.39 (77,24)	0.36 (281,24)	0.36 (303,24)	0.31 (237,24)	0.30 (130,24)
11(46.98, -17.10)	0.35 (152,24)	0.28 (130,24)	0.28 (227,24)	0.28 (303,24)	0.24 (188,24)
12(43.30, -25.00)	0.35 (152,24)	0.35 (147,24)	0.34 (28,24)	0.32 (359,24)	0.31 (226,24)
13(38.30, -32.14)	0.49 (147,24)	0.37 (187,24)	0.36 (20,24)	0.35 (359,24)	0.33 (188,24)
' 32.14, -38.30)	0.39 (147,24)	0.34 (20,24)	0.2[illegible] 48,24)	0.26 (135,24)	0.25 (60,24)

15(	25.00, -43.30)	0.34	(174,24)	0.19	(148,24)	0.18	(60,24)	0.18	(236,24)	0.17	(135,24)
16(	17.10, -46.98)	0.36	(174,24)	0.19	(236,24)	0.18	(148,24)	0.18	(129,24)	0.13	(133,24)
17(	8.68, -49.24)	0.13	(179,24)	0.13	(205,24)	0.12	(278,24)	0.12	(293,24)	0.12	(38,24)
18(	0.00, -50.00)	0.11	(193,24)	0.11	(179,24)	0.11	(205,24)	0.11	(218,24)	0.10	(278,24)
19(	-8.68, -49.24)	0.24	(139,24)	0.18	(62,24)	0.14	(274,24)	0.13	(179,24)	0.13	(218,24)
20(	-17.10, -46.98)	0.53	(174,24)	0.32	(139,24)	0.21	(274,24)	0.18	(220,24)	0.18	(144,24)
21(	-25.00, -43.30)	0.38	(174,24)	0.28	(78,24)	0.25	(106,24)	0.21	(179,24)	0.20	(204,24)
22(	-32.14, -38.30)	0.63	(140,24)	0.29	(89,24)	0.28	(106,24)	0.23	(179,24)	0.23	(204,24)
23(	-38.30, -32.14)	0.66	(165,24)	0.42	(140,24)	0.26	(271,24)	0.23	(27,24)	0.23	(89,24)
24(	-43.30, -25.00)	0.46	(140,24)	0.45	(165,24)	0.40	(222,24)	0.27	(234,24)	0.26	(27,24)
25(	-46.98, -17.10)	0.43	(222,24)	0.42	(120,24)	0.38	(139,24)	0.30	(79,24)	0.30	(124,24)
26(	-49.24, -8.68)	0.54	(119,24)	0.47	(79,24)	0.41	(120,24)	0.37	(139,24)	0.31	(133,24)
27(	-50.00, 0.00)	0.58	(119,24)	0.52	(130,24)	0.52	(155,24)	0.47	(149,24)	0.43	(135,24)
28(	-49.24, 8.68)	0.63	(140,24)	0.48	(155,24)	0.36	(135,24)	0.35	(222,24)	0.33	(149,24)
29(	-46.98, 17.10)	0.47	(140,24)	0.35	(155,24)	0.31	(116,24)	0.28	(206,24)	0.27	(130,24)
30(	-43.30, 25.00)	0.30	(165,24)	0.25	(159,24)	0.24	(205,24)	0.21	(118,24)	0.19	(143,24)
31(	-38.30, 32.14)	0.38	(165,24)	0.37	(159,24)	0.25	(205,24)	0.24	(118,24)	0.22	(204,24)
32(	-32.14, 38.30)	0.45	(165,24)	0.23	(130,24)	0.21	(159,24)	0.21	(204,24)	0.20	(227,24)
33(	-25.00, 43.30)	0.67	(165,24)	0.30	(130,24)	0.30	(263,24)	0.26	(281,24)	0.25	(227,24)
34(	-17.10, 46.98)	0.35	(281,24)	0.33	(165,24)	0.30	(188,24)	0.20	(211,24)	0.18	(293,24)
35(	-8.68, 49.24)	0.37	(180,24)	0.36	(150,24)	0.33	(188,24)	0.22	(293,24)	0.21	(152,24)
36(	0.00, 50.00)	0.65	(150,24)	0.55	(180,24)	0.43	(159,24)	0.42	(130,24)	0.35	(188,24)
37(	17.36, 98.48)	0.99	(150,24)	0.97	(130,24)	0.70	(125,24)	0.60	(184,24)	0.60	(175,24)
38(	34.20, 93.97)	0.72	(130,24)	0.69	(91,24)	0.62	(184,24)	0.61	(125,24)	0.58	(180,24)
39(	50.00, 86.60)	0.69	(91,24)	0.67	(87,24)	0.61	(56,24)	0.55	(160,24)	0.47	(210,24)
40(	64.28, 76.60)	0.64	(286,24)	0.56	(153,24)	0.56	(87,24)	0.51	(160,24)	0.50	(273,24)
41(	76.60, 64.28)	1.28	(3,24)	0.73	(161,24)	0.73	(286,24)	0.73	(118,24)	0.66	(142,24)
42(	86.60, 50.00)	1.10	(142,24)	1.09	(161,24)	1.00	(305,24)	0.98	(3,24)	0.97	(159,24)
43(	93.97, 34.20)	1.27	(159,24)	1.02	(77,24)	1.02	(152,24)	0.84	(161,24)	0.80	(208,24)
44(	98.48, 17.36)	0.83	(208,24)	0.77	(77,24)	0.74	(79,24)	0.62	(3,24)	0.57	(170,24)
45(	100.00, 0.00)	0.92	(77,24)	0.79	(172,24)	0.76	(79,24)	0.69	(66,24)	0.65	(237,24)
46(	98.48, -17.36)	0.61	(281,24)	0.60	(171,24)	0.56	(203,24)	0.55	(172,24)	0.52	(237,24)
47(	93.97, -34.20)	0.64	(140,24)	0.60	(171,24)	0.56	(95,24)	0.53	(359,24)	0.50	(320,24)
48(	86.60, -50.00)	0.80	(359,24)	0.77	(28,24)	0.57	(19,24)	0.55	(60,24)	0.48	(328,24)
49(	76.60, -64.28)	0.86	(359,24)	0.72	(187,24)	0.71	(28,24)	0.71	(147,24)	0.69	(19,24)
50(	64.28, -76.60)	0.72	(19,24)	0.65	(147,24)	0.64	(297,24)	0.57	(20,24)	0.48	(135,24)
51(	50.00, -86.60)	0.79	(8,24)	0.48	(135,24)	0.46	(357,24)	0.44	(301,24)	0.41	(297,24)
52(	34.20, -93.97)	0.48	(65,24)	0.45	(8,24)	0.41	(26,24)	0.40	(357,24)	0.37	(24,24)
53(	17.36, -98.48)	0.22	(12,24)	0.21	(20,24)	0.18	(293,24)	0.18	(38,24)	0.16	(179,24)
54(	0.00,-100.00)	0.34	(12,24)	0.23	(62,24)	0.19	(20,24)	0.17	(293,24)	0.17	(38,24)
55(	-17.36, -98.48)	0.31	(12,24)	0.25	(62,24)	0.21	(49,24)	0.19	(139,24)	0.18	(116,24)
56(	-34.20, -93.97)	0.42	(174,24)	0.25	(116,24)	0.20	(49,24)	0.19	(139,24)	0.18	(330,24)
57(	-50.00, -86.60)	0.26	(174,24)	0.22	(106,24)	0.22	(78,24)	0.16	(140,24)	0.16	(204,24)
58(	-64.28, -76.60)	0.43	(140,24)	0.23	(106,24)	0.22	(89,24)	0.19	(28,24)	0.17	(204,24)
59(	-76.60, -64.28)	0.52	(165,24)	0.36	(37,24)	0.31	(140,24)	0.25	(28,24)	0.24	(124,24)
60(	-86.60, -50.00)	0.55	(139,24)	0.49	(221,24)	0.46	(222,24)	0.46	(177,24)	0.37	(37,24)
61(	-93.97, -34.20)	0.76	(139,24)	0.72	(132,24)	0.68	(315,24)	0.61	(133,24)	0.52	(222,24)
62(	-98.48, -17.36)	0.78	(119,24)	0.74	(132,24)	0.63	(133,24)	0.57	(79,24)	0.57	(315,24)
63(	-100.00, 0.00)	0.75	(119,24)	0.48	(149,24)	0.48	(282,24)	0.45	(135,24)	0.41	(222,24)
64(	-98.48, 17.36)	0.53	(140,24)	0.39	(222,24)	0.38	(155,24)	0.37	(135,24)	0.32	(149,24)
65(	-93.97, 34.20)	0.36	(140,24)	0.26	(155,24)	0.26	(116,24)	0.23	(220,24)	0.23	(219,24)
66(	-86.60, 50.00)	0.36	(165,24)	0.26	(120,24)	0.25	(282,24)	0.23	(159,24)	0.23	(143,24)
67(	-76.60, 64.28)	0.48	(165,24)	0.46	(204,24)	0.45	(159,24)	0.40	(282,24)	0.37	(205,24)
68(	-64.28, 76.60)	0.46	(165,24)	0.41	(204,24)	0.38	(39,24)	0.29	(219,24)	0.27	(225,24)
69(	-50.00, 86.60)	0.44	(165,24)	0.31	(263,24)	0.25	(303,24)	0.25	(39,24)	0.25	(36,24)
70(	-34.20, 93.97)	0.29	(281,24)	0.26	(286,24)	0.25	(79,24)	0.22	(211,24)	0.22	(303,24)
71(	-17.36, 98.48)	0.47	(252,24)	0.41	(246,24)	0.35	(191,24)	0.34	(275,24)	0.34	(152,24)
72(	0.00, 100.00)	0.69	(180,24)	0.62	(246,24)	0.60	(130,24)	0.57	(150,24)	0.55	(175,24)
73(	19.33, 46.66)	0.55	(130,24)	0.48	(150,24)	0.44	(152,24)	0.39	(91,24)	0.38	(87,24)
74(	55.93, 55.93)	0.83	(91,24)	0.79	(3,24)	0.74	(118,24)	0.69	(286,24)	0.69	(189,24)

75(58.11, 24.07)	1.30 (161,24) *	1.18 (159,24)	1.12 (152,24)	1.12 (305,24)	0.96 (165,24)
76(-108.28, 44.85)	0.35 (140,24)	0.32 (143,24)	0.27 (116,24)	0.26 (120,24)	0.25 (219,24)
77(-33.02, 33.02)	0.42 (165,24)	0.23 (205,24)	0.23 (118,24)	0.20 (204,24)	0.19 (130,24)
78(-15.31, 36.96)	0.33 (165,24)	0.28 (281,24)	0.14 (263,24)	0.14 (293,24)	0.13 (91,24)
79(0.00, 41.00)	0.59 (150,24)	0.42 (159,24)	0.38 (180,24)	0.34 (188,24)	0.29 (130,24)

COMPLEX - 1971

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              COMPLEX-1 (DATED 86064)
              AN AIR QUALITY DISPERSION MODEL IN
              SECTION 4. ADDITIONAL MODELS FOR REGULATORY USE
              IN UNAMAP (VERSION 6) JULY 86.
              SOURCE: FILE 31 ON UNAMAP MAGNETIC TAPE FORM NTIS.


                                 COMPLEX I  - VERSION 86064
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

                         GENERAL INPUT INFORMATION

 THIS RUN OF COMPLEX I -VERSION 86064 IS FOR THE POLLUTANT SO2  FOR 8760   1-HOUR PERIODS.
 CONCENTRATION ESTIMATES BEGIN ON HOUR- 1,JULIAN DAY-  1, YEAR-1971.
 A FACTOR OF      0.0010000 HAS BEEN SPECIFIED TO CONVERT USER LENGTH UNITS TO KILOMETERS.
  1 SIGNIFICANT SOURCES ARE TO BE CONSIDERED.
THIS RUN WILL NOT CONSIDER ANY POLLUTANT LOSS.
 HIGH-FIVE SUMMARY CONCENTRATION TABLES WILL BE OUTPUT FOR   4 AVERAGING PERIODS.
 AVG TIMES OF 1,3,8, AND 24 HOURS ARE AUTOMATICALLY DISPLAYED.
  A FACTOR OF      0.3048000 HAS BEEN SPECIFIED TO CONVERT USER HEIGHT UNITS TO METERS.

 OPTION      OPTION LIST                 OPTION SPECIFICATION : 0= IGNORE OPTION
                                                                1= USE OPTION
                     TECHNICAL OPTIONS
     1       TERRAIN ADJUSTMENTS                                 1
     2       DO NOT INCLUDE STACK DOWNWASH CALCULATIONS          0
     3       DO NOT INCLUDE GRADUAL PLUME RISE CALCULATIONS      1
     4       CALCULATE INITIAL PLUME SIZE                        1
                     INPUT OPTIONS
     5       READ MET DATA FROM CARDS                            0
     6       READ HOURLY EMISSIONS                               0
     7       SPECIFY SIGNIFICANT SOURCES                         0
     8       READ RADIAL DISTANCES TO GENERATE RECEPTORS         1
                     PRINTED OUTPUT OPTIONS
     9       DELETE EMISSIONS WITH HEIGHT TABLE                  1
    10       DELETE MET DATA SUMMARY FOR AVG PERIOD              1
    11       DELETE HOURLY CONTRIBUTIONS                         1
    12       DELETE MET DATA ON HOURLY CONTRIBUTIONS             1
    13       DELETE FINAL PLUME RISE CALC ON HRLY CONTRIBUTIONS  1
    14       DELETE HOURLY SUMMARY                               1
    15       DELETE MET DATA ON HRLY SUMMARY                     1
    16       DELETE FINAL PLUME RISE CALC ON HRLY SUMMARY        1
    17       DELETE AVG-PERIOD CONTRIBUTIONS                     1
    18       DELETE AVERAGING PERIOD SUMMARY                     1
    19       DELETE AVG CONCENTRATIONS AND HI-5 TABLES           0
                     OTHER CONTROL AND OUTPUT OPTIONS
    20       RUN IS PART OF A SEGMENTED RUN                      0
    21       WRITE PARTIAL CONC TO DISK OR TAPE                  0
    22       WRITE HOURLY CONC TO DISK OR TAPE                   0
    23       WRITE AVG-PERIOD CONC TO DISK OR TAPE               0
    24       PUNCH AVG-PERIOD CONC ONTO CARDS                    0
    25       COMPLEX TERRAIN OPTION                              1
    26       CALM PROCESSING OPTION                              0
    27       VALLEY SCREENING OPTION                             0

ANEMOMETER HEIGHT IS:      10.00
EXPONENTS FOR POWER- LAW WIND INCREASE WITH HEIGHT ARE:0.07,0.07,0.10,0.15,0.35,0.55
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TERRAIN ADJUSTMENTS ARE: 0.500,0.500,0.500,0.500,0.000,0.000 ZMIN IS 10.0

POINT SOURCE INFORMATION

SOURCE	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	SO2(G/SEC) EMISSIONS	PART(G/SEC) EMISSIONS	STACK HT(M)	STACK TEMP(K)	STACK DIAM(M)	STACK VEL(M/SEC)	POTEN. IMPACT (MICRO G/M**3)	EFF HT(M)	GRD-LVL ELEV USER HT UNITS	BUOY FLUX F M**4/S**3
1 FLARE STACK	0.00	0.00	0.01	0.00	10.0	999.0	0.5	0.4	3.08	11.79	108.00	0.16

SIGNIFICANT SO2 POINT SOURCES

RANK	CHI-MAX (MICROGRAMS/M**3)	SOURCE NO.
1	3.08	1

ADDITIONAL INFORMATION ON SOURCES.

EMISSION INFORMATION FOR 1 (NPT) POINT SOURCES HAS BEEN INPUT
1 SIGNIFICANT POINT SOURCES(NSIGP) ARE TO BE USED FOR THIS RUN
THE ORDER OF SIGNIFICANCE(IMPS) FOR 25 OR LESS POINT SOURCES USED IN THIS RUN AS LISTED BY POINT SOURCE NUMBER:
1
SURFACE MET DATA FROM STATION(ISFCD) 14739, YEAR(ISFCYR) 1971
MIXING HEIGHT DATA FROM STATION(IMXD) 14764, YEAR(IMXYR) 1971

RECEPTOR INFORMATION

COMPLEX I INTERNALLY GENERATES 36 RECEPTORS ON A CIRCLE CORRESPONDING TO EACH NON-ZERO RADIAL DISTANCE FROM A CENTER POINT
COORDINATES ARE (USER UNITS): (0.000, 0.000)
RADIAL DISTANCE(S) USER SPECIFIED (USER UNITS): 50.000 100.000 0.000 0.000 0.000

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)
1	10,0050	8.682	49.240	0.0	115.0
2	20,0050	17.101	46.985	0.0	119.0
3	30,0050	25.000	43.301	0.0	122.0
4	40,0050	32.139	38.302	0.0	125.0
5	50,0050	38.302	32.139	0.0	127.0
6	60,0050	43.301	25.000	0.0	129.0
7	70,0050	46.985	17.101	0.0	128.0
8	80,0050	49.240	8.682	0.0	126.0
9	90,0050	50.000	0.000	0.0	123.0
10	100,0050	49.240	-8.682	0.0	121.0
11	110,0050	46.985	-17.101	0.0	116.0
12	120,0050	43.301	-25.000	0.0	118.0
13	130,0050	38.302	-32.139	0.0	117.0
14	140,0050	32.139	-38.302	0.0	113.0
15	150,0050	25.000	-43.301	0.0	106.0
16	160,0050	17.101	-46.985	0.0	108.0
17	170,0050	8.682	-49.240	0.0	102.0
18	180,0050	0.000	-50.000	0.0	99.0
19	190,0050	-8.682	-49.240	0.0	102.0
20	200,0050	-17.101	-46.985	0.0	108.0
21	210,0050	-25.000	-43.301	0.0	110.0
22	220,0050	-32.139	-38.302	0.0	112.0
23	230,0050	-38.302	-32.139	0.0	113.0
24	240,0050	-43.301	-25.000	0.0	115.0
25	250,0050	-46.985	-17.101	0.0	115.0

26	260,0050	-49.240	-8.682	0.0	113.0
27	270,0050	-50.000	0.000	0.0	110.0
28	280,0050	-49.240	8.682	0.0	105.0
29	290,0050	-46.985	17.101	0.0	103.0
30	300,0050	-43.301	25.000	0.0	97.0
31	310,0050	-38.302	32.139	0.0	92.0
32	320,0050	-32.139	38.302	0.0	96.0
33	330,0050	-25.000	43.301	0.0	103.0
34	340,0050	-17.101	46.985	0.0	108.0
35	350,0050	-8.682	49.240	0.0	111.0
36	360,0050	0.000	50.000	0.0	113.0
37	10,0100	17.365	98.481	0.0	108.0
38	20,0100	34.202	93.969	0.0	113.0
39	30,0100	50.000	86.603	0.0	120.0
40	40,0100	64.279	76.604	0.0	124.0
41	50,0100	76.604	64.279	0.0	128.0
42	60,0100	86.603	50.000	0.0	128.0
43	70,0100	93.969	34.202	0.0	128.0
44	80,0100	98.481	17.365	0.0	127.0
45	90,0100	100.000	0.000	0.0	130.0
46	100,0100	98.481	-17.365	0.0	125.0
47	110,0100	93.969	-34.202	0.0	120.0
48	120,0100	86.603	-50.000	0.0	117.0
49	130,0100	76.604	-64.279	0.0	113.0
50	140,0100	64.279	-76.604	0.0	111.0
51	150,0100	50.000	-86.603	0.0	111.0
52	160,0100	34.202	-93.969	0.0	107.0
53	170,0100	17.365	-98.481	0.0	88.0
54	180,0100	0.000	-100.000	0.0	84.0
55	190,0100	-17.365	-98.481	0.0	82.0
56	200,0100	-34.202	-93.969	0.0	82.0
57	210,0100	-50.000	-86.603	0.0	82.0
58	220,0100	-64.279	-76.604	0.0	84.0
59	230,0100	-76.604	-64.279	0.0	96.0
60	240,0100	-86.602	-50.000	0.0	108.0
61	250,0100	-93.969	-34.202	0.0	111.0
62	260,0100	-98.481	-17.365	0.0	106.0
63	270,0100	-100.000	0.000	0.0	98.0
64	280,0100	-98.481	17.365	0.0	88.0
65	290,0100	-93.969	34.202	0.0	76.0
66	300,0100	-86.603	50.000	0.0	76.0
67	310,0100	-76.605	64.279	0.0	80.0
68	320,0100	-64.279	76.604	0.0	85.0
69	330,0100	-50.000	86.602	0.0	87.0
70	340,0100	-34.202	93.969	0.0	97.0
71	350,0100	-17.365	98.481	0.0	106.0
72	360,0100	0.000	100.000	0.0	110.0
73	FENC22.5	19.330	46.660	0.0	120.0
74	FENC45.0	55.930	55.930	0.0	126.0
75	FENC67.5	58.110	24.070	0.0	130.0
76	FEN292.5	-108.280	44.850	0.0	74.0
77	FEN315.0	-33.020	33.020	0.0	94.0
78	FEN337.5	-15.310	36.960	0.0	112.0
79	FEN360.0	0.000	41.000	0.0	116.0

RECEPTORS

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)	DAY	AVG CONC FOR PERIOD 1.HR 1. TO DAY365.HR24. (MICROGRAMS/M**3)
1	10,0050	8.68	49.24	0.0	115.0		0.01
2	20,0050	17.10	46.98	0.0	119.0		0.01
3	30,0050	25.00	43.30	0.0	122.0		0.01
4	40,0050	32.14	38.30	0.0	125.0		0.01
5	50,0050	38.30	32.14	0.0	127.0		0.02
6	60,0050	43.30	25.00	0.0	129.0		0.03
7	70,0050	46.98	17.10	0.0	128.0		0.03
8	80,0050	49.24	8.68	0.0	126.0		0.03
9	90,0050	50.00	0.00	0.0	123.0		0.03
10	100,0050	49.24	-8.68	0.0	121.0		0.03
11	110,0050	46.98	-17.10	0.0	116.0		0.02
12	120,0050	43.30	-25.00	0.0	118.0		0.02
13	130,0050	38.30	-32.14	0.0	117.0		0.02
14	140,0050	32.14	-38.30	0.0	113.0		0.01
15	150,0050	25.00	-43.30	0.0	106.0		0.01
16	160,0050	17.10	-46.98	0.0	108.0		0.01
17	170,0050	8.68	-49.24	0.0	102.0		0.01
18	180,0050	0.00	-50.00	0.0	99.0		0.01
19	190,0050	-8.68	-49.24	0.0	102.0		0.01
20	200,0050	-17.10	-46.98	0.0	108.0		0.01
21	210,0050	-25.00	-43.30	0.0	110.0		0.01
22	220,0050	-32.14	-38.30	0.0	112.0		0.00
23	230,0050	-38.30	-32.14	0.0	113.0		0.01
24	240,0050	-43.30	-25.00	0.0	115.0		0.01
25	250,0050	-46.98	-17.10	0.0	115.0		0.02
26	260,0050	-49.24	-8.68	0.0	113.0		0.02
27	270,0050	-50.00	0.00	0.0	110.0		0.02
28	280,0050	-49.24	8.68	0.0	105.0		0.01
29	290,0050	-46.98	17.10	0.0	103.0		0.02
30	300,0050	-43.30	25.00	0.0	97.0		0.01
31	310,0050	-38.30	32.14	0.0	92.0		0.01
32	320,0050	-32.14	38.30	0.0	96.0		0.01
33	330,0050	-25.00	43.30	0.0	103.0		0.01
34	340,0050	-17.10	46.98	0.0	108.0		0.01
35	350,0050	-8.68	49.24	0.0	111.0		0.01
36	360,0050	0.00	50.00	0.0	113.0		0.01
37	10,0100	17.36	98.48	0.0	108.0		0.06
38	20,0100	34.20	93.97	0.0	113.0		0.06
39	30,0100	50.00	86.60	0.0	120.0		0.05
40	40,0100	64.28	76.60	0.0	124.0		0.05
41	50,0100	76.60	64.28	0.0	128.0		0.07
42	60,0100	86.60	50.00	0.0	128.0		0.09
43	70,0100	93.97	34.20	0.0	128.0		0.10
44	80,0100	98.48	17.36	0.0	127.0		0.09
45	90,0100	100.00	0.00	0.0	130.0		0.10
46	100,0100	98.48	-17.36	0.0	125.0		* 0.10
47	110,0100	93.97	-34.20	0.0	120.0		0.10
48	120,0100	86.60	-50.00	0.0	117.0		0.10
49	130,0100	76.60	-64.28	0.0	113.0		0.09
50	140,0100	64.28	-76.60	0.0	111.0		0.06
51	150,0100	50.00	-86.60	0.0	111.0		0.05
52	160,0100	34.20	-93.97	0.0	107.0		0.05
53	170,0100	17.36	-98.48	0.0	88.0		0.02
54	180,0100	0.00	-100.00	0.0	84.0		0.02

55	190,0100	-17.36	-98.48	0.0	82.0	0.01
56	200,0100	-34.20	-93.97	0.0	82.0	0.01
57	210,0100	-50.00	-86.60	0.0	82.0	0.01
58	220,0100	-64.28	-76.60	0.0	84.0	0.01
59	230,0100	-76.60	-64.28	0.0	96.0	0.02
60	240,0100	-86.60	-50.00	0.0	108.0	0.04
61	250,0100	-93.97	-34.20	0.0	111.0	0.06
62	260,0100	-98.48	-17.36	0.0	106.0	0.06
63	270,0100	-100.00	0.00	0.0	98.0	0.04
64	280,0100	-98.48	17.36	0.0	88.0	0.02
65	290,0100	-93.97	34.20	0.0	76.0	0.02
66	300,0100	-86.60	50.00	0.0	76.0	0.02
67	310,0100	-76.60	64.28	0.0	80.0	0.02
68	320,0100	-64.28	76.60	0.0	85.0	0.02
69	330,0100	-50.00	86.60	0.0	87.0	0.02
70	340,0100	-34.20	93.97	0.0	97.0	0.02
71	350,0100	-17.36	98.48	0.0	106.0	0.03
72	360,0100	0.00	100.00	0.0	110.0	0.05
73	FENC22.5	19.33	46.66	0.0	120.0	0.01
74	FENC45.0	55.93	55.93	0.0	126.0	0.04
75	FENC67.5	58.11	24.07	0.0	130.0	0.05
76	FEN292.5	-108.28	44.85	0.0	74.0	0.02
77	FEN315.0	-33.02	33.02	0.0	94.0	0.01
78	FEN337.5	-15.31	36.96	0.0	112.0	0.01
79	FEN360.0	0.00	41.00	0.0	116.0	0.01

FIVE HIGHEST 1-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	6.43 (185, 8)	5.71 (282,10)	5.71 (159,15)	5.71 (169, 9)	4.95 (135, 9)
2(17.10, 46.98)	7.80 (157, 8)	7.75 (303, 8)	7.21 (185, 8)	7.21 (197, 8)	5.71 (169, 9)
3(25.00, 43.30)	9.07 (132, 8)	9.06 (157, 8)	9.00 (303, 8)	7.21 (197, 8)	5.71 (131,10)
4(32.14, 38.30)	9.74 (303, 8)	9.74 (132, 8)	8.45 (191,11)	7.21 (197, 8)	5.71 (114,10)
5(38.30, 32.14)	9.74 (132, 9)	9.74 (158, 9)	8.45 (178,13)	8.45 (191,11)	5.71 (57,13)
6(43.30, 25.00)	9.74 (132, 9)	9.74 (158, 9)	8.45 (178,13)	7.21 (158, 8)	7.21 (232,10)
7(46.98, 17.10)	9.75 (57,12)	9.75 (149, 6)	9.74 (185, 7)	9.74 (132, 9)	9.74 (169, 8)
8(49.24, 8.68)	9.75 (57,12)	9.75 (149, 6)	9.74 (300, 9)	9.74 (185, 7)	9.74 (169, 8)
9(50.00, 0.00)	9.57 (169, 8)	9.51 (185, 7)	9.50 (300, 9)	9.44 (149, 6)	9.37 (57,12)
10(49.24, -8.68)	8.62 (167, 8)	8.45 (191,12)	7.05 (303, 9)	5.71 (131, 9)	5.71 (278,10)
11(46.98, -17.10)	6.67 (167, 8)	6.56 (318,13)	5.71 (131, 9)	5.71 (168, 8)	5.71 (278,10)
12(43.30, -25.00)	7.34 (135, 7)	7.29 (318,13)	5.71 (168, 8)	5.71 (163, 9)	5.71 (191, 8)
13(38.30, -32.14)	7.00 (157, 6)	6.96 (135, 7)	5.71 (159,10)	4.75 (85,12)	4.75 (268,10)
14(32.14, -38.30)	5.64 (157, 6)	5.61 (135, 7)	5.56 (159,10)	4.75 (168, 9)	4.75 (191,13)
15(25.00, -43.30)	3.63 (148, 8)	3.42 (178,10)	3.41 (229, 9)	3.37 (55,12)	2.99 (189,12)
16(17.10, -46.98)	4.19 (317,12)	4.05 (202, 8)	4.03 (148, 8)	3.78 (178,10)	3.78 (229, 9)
17(8.68, -49.24)	3.09 (220, 9)	3.04 (95, 9)	2.97 (234, 9)	2.97 (230, 7)	2.94 (245, 7)
18(0.00, -50.00)	2.59 (220, 9)	2.55 (95, 9)	2.48 (168,10)	2.48 (173, 8)	2.46 (121, 9)
19(-8.68, -49.24)	3.09 (259, 9)	3.09 (220, 9)	2.94 (168,10)	2.94 (173, 8)	2.93 (300, 8)
20(-17.10, -46.98)	4.30 (259, 9)	4.28 (206, 8)	4.03 (138, 8)	4.00 (82,10)	3.78 (161,11)
21(-25.00, -43.30)	4.81 (206, 8)	4.78 (259, 9)	4.46 (138, 8)	4.05 (82,11)	4.05 (184,10)
22(-32.14, -38.30)	5.39 (208,13)	5.36 (300,11)	5.19 (35,11)	1.45 (293, 8)	1.32 (209, 7)
23(-38.30, -32.14)	5.70 (208,13)	5.66 (300,11)	5.59 (321,12)	5.54 (296,11)	5.52 (266, 9)
24(-43.30, -25.00)	6.24 (321,12)	5.71 (128,12)	5.71 (266, 9)	5.71 (296,11)	4.75 (293,12)
25(-46.98, -17.10)	5.71 (128,12)	5.71 (230, 9)	4.76 (35,12)	4.75 (145,11)	4.75 (209,12)
26(-49.24, -8.68)	5.64 (277,11)	5.56 (230, 9)	5.56 (78,10)	4.75 (102,13)	4.75 (145,11)
27(-50.00, 0.00)	4.95 (245, 9)	4.78 (163,14)	4.76 (277,11)	4.69 (78,10)	4.48 (238, 9)
28(-49.24, 8.68)	3.74 (245, 9)	3.66 (163,14)	3.56 (238, 8)	3.54 (149, 8)	3.47 (213,12)
[illegible] -46.98, 17.10)	6.72 (161,12)	3.27 (102, 9)	3.1[illegible] [illegible]38, 8)	3.12 (149, 8)	3.12 (159,12)

30(-43.30, 25.00)	5.40 (161,12)	4.93 (163,11)	2.30 (228,15)	2.30 (234,10)	2.29 (245,10)
31(-38.30, 32.14)	4.45 (161,12)	4.09 (163,11)	1.68 (228,15)	1.68 (234,10)	1.67 (245,10)
32(-32.14, 38.30)	4.75 (163,11)	2.18 (259,10)	2.17 (164,11)	2.08 (169,11)	2.08 (213,11)
33(-25.00, 43.30)	6.08 (158,10)	3.35 (259,10)	3.26 (157, 9)	3.12 (277,10)	3.11 (163,12)
34(-17.10, 46.98)	7.15 (158,10)	4.44 (164,10)	4.29 (157, 9)	4.26 (100,11)	4.25 (303,11)
35(-8.68, 49.24)	5.23 (164,10)	5.05 (303,11)	4.98 (100,11)	4.70 (237,10)	4.65 (57,11)
36(0.00, 50.00)	5.80 (185, 8)	5.66 (303,11)	5.55 (159,15)	5.51 (282,10)	4.75 (204, 8)
37(17.36, 98.48)	7.63 (135, 9)	5.23 (185, 8)	4.49 (131, 5)	4.42 (169, 9)	4.42 (159,15)
38(34.20, 93.97)	6.84 (157, 8)	6.83 (303, 8)	5.64 (197, 8)	5.64 (185, 8)	5.42 (208,19)
39(50.00, 86.60)	7.60 (132, 8)	7.60 (157, 8)	7.58 (303, 8)	6.89 (208,19)	6.58 (190, 6)
40(64.28, 76.60)	7.97 (132, 8)	7.97 (303, 8)	7.84 (208,19)	7.82 (222, 5)	7.80 (203, 6)
41(76.60, 64.28)	8.83 (222, 5)	8.81 (203, 6)	7.97 (158, 9)	7.97 (132, 9)	7.24 (282, 7)
42(86.60, 50.00)	8.83 (222, 5)	8.81 (203, 6)	7.97 (158, 9)	7.97 (132, 9)	5.99 (232,10)
43(93.97, 34.20)	8.86 (128, 5)	7.97 (169, 8)	7.97 (132, 9)	7.97 (185, 7)	7.97 (149, 6)
44(98.48, 17.36)	8.86 (128, 5)	7.97 (169, 8)	7.97 (185, 7)	7.97 (300, 9)	7.97 (149, 6)
45(100.00, 0.00)	7.97 (169, 8)	7.97 (185, 7)	7.97 (300, 9)	7.97 (149, 6)	7.97 (57,12)
46(98.48, -17.36)	10.24 (303, 9)	7.97 (167, 8)	7.24 (169, 5)	5.42 (48, 9)	5.42 (259, 8)
47(93.97, -34.20)	9.45 (303, 9)	7.60 (167, 8)	7.56 (318,13)	6.58 (230, 6)	6.57 (169, 5)
48(86.60, -50.00)	7.25 (135, 7)	7.24 (318,13)	6.14 (149, 5)	6.03 (230, 6)	5.30 (353,13)
49(76.60, -64.28)	6.84 (157, 6)	6.82 (135, 7)	5.35 (220, 5)	5.34 (149, 5)	5.34 (230, 6)
50(64.28, -76.60)	6.62 (157, 6)	6.61 (135, 7)	4.98 (220, 5)	4.95 (277, 9)	4.61 (159,10)
51(50.00, -86.60)	5.01 (220, 6)	4.98 (245, 6)	4.95 (277, 9)	4.51 (237, 8)	4.50 (309,12)
52(34.20, -93.97)	6.18 (317,12)	4.37 (245, 6)	4.31 (220, 6)	3.96 (318,11)	3.76 (202, 8)
53(17.36, -98.48)	4.36 (234, 9)	4.36 (230, 7)	4.34 (245, 7)	4.34 (149, 7)	4.32 (317,12)
54(0.00,-100.00)	4.01 (234, 9)	4.01 (230, 7)	3.99 (245, 7)	3.99 (300, 8)	3.99 (149, 7)
55(-17.36, -98.48)	4.36 (294,10)	3.82 (300, 8)	2.82 (259, 9)	2.81 (220, 9)	2.46 (168,10)
56(-34.20, -93.97)	4.38 (176, 6)	4.36 (294,10)	3.84 (206, 8)	2.82 (259, 9)	2.46 (138, 8)
57(-50.00, -86.60)	4.38 (176, 6)	4.36 (294,10)	3.84 (206, 8)	2.82 (259, 9)	2.46 (138, 8)
58(-64.28, -76.60)	4.01 (208,13)	4.00 (300,11)	3.95 (35,11)	2.32 (331, 7)	1.80 (151,19)
59(-76.60, -64.28)	5.11 (208,13)	5.10 (300,11)	5.07 (321,12)	5.04 (35,11)	3.65 (296,11)
60(-86.60, -50.00)	6.29 (321,12)	4.54 (300,12)	4.53 (161,19)	4.42 (296,11)	4.41 (266, 9)
61(-93.97, -34.20)	7.97 (35,12)	5.03 (213,19)	5.00 (300,12)	4.61 (230, 9)	4.60 (128,12)
62(-98.48, -17.36)	7.31 (319,11)	7.24 (35,12)	6.10 (277,11)	6.07 (78,10)	4.29 (230, 9)
63(-100.00, 0.00)	6.22 (319,11)	5.29 (277,11)	5.26 (78,10)	4.44 (245, 9)	3.78 (163,14)
64(-98.48, 17.36)	4.35 (238, 8)	4.34 (149, 8)	3.69 (245, 9)	3.16 (163,14)	2.76 (213,12)
65(-93.97, 34.20)	3.59 (161,12)	3.35 (238, 8)	3.34 (149, 8)	2.86 (102, 9)	2.19 (159,12)
66(-86.60, 50.00)	3.59 (161,12)	3.34 (149, 8)	3.00 (163,11)	2.86 (102, 9)	2.49 (228,15)
67(-76.60, 64.28)	4.14 (126,14)	3.78 (161,12)	3.63 (102,10)	3.15 (163,11)	3.14 (164,11)
68(-64.28, 76.60)	4.67 (126,14)	4.08 (277,10)	4.05 (102,10)	3.48 (259,10)	3.48 (164,11)
69(-50.00, 86.60)	4.90 (126,14)	4.25 (277,10)	4.23 (102,10)	3.63 (259,10)	3.41 (158,10)
70(-34.20, 93.97)	5.19 (303,11)	4.36 (164,10)	3.79 (158,10)	3.71 (157, 9)	3.70 (100,11)
71(-17.36, 98.48)	7.35 (135, 9)	6.10 (303,11)	5.07 (164,10)	4.28 (100,11)	4.21 (248,18)
72(0.00, 100.00)	7.93 (135, 9)	6.52 (303,11)	5.40 (185, 8)	4.79 (131, 5)	4.55 (159,15)
73(19.33, 46.66)	8.30 (157, 8)	8.25 (303, 8)	7.28 (197, 8)	5.77 (169, 9)	4.80 (190, 8)
74(55.93, 55.93)	9.86 (132, 8) *	9.86 (158, 9)	7.23 (222, 5)	7.20 (203, 6)	7.11 (282, 7)
75(58.11, 24.07) *	10.73 (132, 9)	8.02 (158, 8)	8.02 (232,10)	7.54 (178,13)	6.38 (57,13)
76(-108.28, 44.85)	3.32 (238, 8)	3.32 (149, 8)	3.09 (161,12)	2.75 (102, 9)	2.04 (159,12)
77(-33.02, 33.02)	4.05 (163,11)	1.52 (228,15)	1.51 (234,10)	1.51 (245,10)	1.50 (286,10)
78(-15.31, 36.96)	7.44 (158,10)	3.45 (157, 9)	3.42 (100,11)	3.32 (164,10)	3.22 (57,11)
79(0.00, 41.00)	4.79 (185, 8)	4.22 (303,11)	4.13 (282,10)	4.13 (159,15)	3.42 (254, 9)

FIVE HIGHEST 3-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	2.45 (254, 9)	2.15 (282,12)	2.14 (185, 9)	1.90 (159,15)	1.90 (169, 9)
2(17.10, 46.98)	2.60 (157, 9)	2.58 (303, 9)	2.40 (185, 9)	2.40 (197, 9)	1.98 (190, 9)
3(25.00, 43.30)	3.77 (132, 9)	3.02 (157, 9)	3.00 (303, 9)	2.40 (197, 9)	1.90 (131,12)
4(32.14, 38.30)	3.99 (132, 9)	3.25 (303, 9)	2.82 (191,12)	2.40 (197, 9)	1.90 (114,12)

5(	38.30, 32.14)	3.82	(158, 9)	3.25	(132, 9)	2.82	(178,15)	2.82	(191,12)	2.40	(132,12)
6(	43.30, 25.00) *	6.22	(158, 9)	3.75	(232,12)	3.25	(132, 9)	2.82	(178,15)	2.62	(222, 9)
7(	46.98, 17.10)	3.82	(57,12)	3.75	(232,12)	3.59	(185, 9)	3.25	(149, 6)	3.25	(132, 9)
8(	49.24, 8.68)	3.82	(57,12)	3.75	(232,12)	3.58	(222,12)	3.25	(149, 6)	3.25	(300, 9)
9(	50.00, 0.00)	3.51	(247,12)	3.25	(278,12)	3.19	(169, 9)	3.17	(185, 9)	3.17	(300, 9)
10(	49.24, -8.68)	5.16	(278,12)	4.28	(191, 9)	3.16	(189,12)	3.16	(247,12)	2.87	(167, 9)
11(	46.98, -17.10)	2.37	(191, 9)	2.22	(167, 9)	2.19	(318,15)	1.90	(131, 9)	1.90	(168, 9)
12(	43.30, -25.00)	2.45	(135, 9)	2.43	(318,15)	1.90	(168, 9)	1.90	(163, 9)	1.90	(191, 9)
13(	38.30, -32.14)	2.35	(157, 6)	2.32	(135, 9)	1.90	(159,12)	1.83	(156,12)	1.83	(85,12)
14(	32.14, -38.30)	1.88	(157, 6)	1.87	(135, 9)	1.85	(159,12)	1.58	(168, 9)	1.58	(191,15)
15(	25.00, -43.30)	1.21	(148, 9)	1.14	(178,12)	1.14	(229, 9)	1.12	(55,12)	1.00	(189,12)
16(	17.10, -46.98)	1.74	(317,12)	1.69	(202, 9)	1.50	(268,12)	1.34	(148, 9)	1.26	(178,12)
17(	8.68, -49.24)	1.36	(234, 9)	1.10	(244,15)	1.03	(220, 9)	1.02	(95, 9)	0.99	(230, 9)
18(	0.00, -50.00)	1.04	(244,15)	0.96	(173, 9)	0.94	(121, 9)	0.91	(217, 9)	0.86	(220, 9)
19(	-8.68, -49.24)	1.17	(173, 9)	1.10	(217, 9)	1.03	(259, 9)	1.03	(220, 9)	0.98	(168,12)
20(	-17.10, -46.98)	2.58	(82,12)	1.43	(259, 9)	1.43	(206, 9)	1.34	(138, 9)	1.26	(161,12)
21(	-25.00, -43.30)	1.60	(206, 9)	1.59	(259, 9)	1.49	(138, 9)	1.35	(82,12)	1.35	(184,12)
22(	-32.14, -38.30)	1.80	(208,15)	1.79	(300,12)	1.73	(35,12)	0.63	(331, 9)	0.48	(293, 9)
23(	-38.30, -32.14)	2.33	(321,12)	2.32	(266, 9)	2.06	(293,12)	1.90	(208,15)	1.89	(300,12)
24(	-43.30, -25.00)	3.25	(296,12)	2.93	(209,12)	2.55	(321,12)	2.49	(266, 9)	2.17	(293,12)
25(	-46.98, -17.10)	3.28	(209,12)	2.70	(294,12)	2.13	(209,15)	1.90	(128,12)	1.90	(230, 9)
26(	-49.24, -8.68)	3.23	(277,12)	2.70	(294,12)	1.93	(209,12)	1.89	(176, 9)	1.86	(209,15)
27(	-50.00, 0.00)	2.94	(277,12)	1.80	(210,12)	1.77	(203, 9)	1.73	(192,12)	1.70	(148,15)
28(	-49.24, 8.68)	2.55	(238, 9)	1.39	(176, 9)	1.33	(220,15)	1.33	(203, 9)	1.25	(192,12)
29(	-46.98, 17.10)	2.24	(161,12)	2.08	(157,12)	1.95	(259,12)	1.89	(158,12)	1.30	(138,15)
30(	-43.30, 25.00)	1.80	(161,12)	1.64	(163,12)	1.45	(157,12)	1.45	(286,12)	1.39	(259,12)
31(	-38.30, 32.14)	1.90	(163,12)	1.48	(161,12)	1.10	(245,12)	1.08	(169,12)	1.03	(169,15)
32(	-32.14, 38.30)	2.28	(163,12)	1.39	(169,12)	1.34	(160,15)	1.27	(220,12)	1.27	(201,12)
33(	-25.00, 43.30)	2.03	(158,12)	1.98	(78,12)	1.22	(226, 9)	1.12	(204,12)	1.12	(259,12)
34(	-17.10, 46.98)	2.38	(158,12)	1.74	(100,12)	1.48	(164,12)	1.43	(157, 9)	1.42	(303,12)
35(	-8.68, 49.24)	2.10	(100,12)	1.74	(164,12)	1.68	(303,12)	1.57	(237,12)	1.55	(57,12)
36(	0.00, 50.00)	2.09	(282,12)	1.98	(254, 9)	1.93	(185, 9)	1.89	(303,12)	1.85	(159,15)
37(	17.36, 98.48)	3.36	(254, 9)	2.54	(135, 9)	2.31	(100, 9)	2.12	(282,12)	1.82	(175, 9)
38(	34.20, 93.97)	2.36	(190, 9)	2.28	(157, 9)	2.28	(303, 9)	1.91	(132, 6)	1.88	(197, 9)
39(	50.00, 86.60)	4.34	(132, 9)	2.53	(157, 9)	2.53	(303, 9)	2.40	(295, 9)	2.30	(208,21)
40(	64.28, 76.60)	4.46	(132, 9)	2.66	(303, 9)	2.61	(208,21)	2.61	(222, 6)	2.60	(203, 6)
41(	76.60, 64.28)	4.10	(158, 9)	3.54	(222, 6)	2.94	(203, 6)	2.66	(132, 9)	2.62	(163, 9)
42(	86.60, 50.00)	6.09	(158, 9)	3.97	(222, 9)	3.54	(222, 6)	3.25	(114, 9)	3.13	(232,12)
43(	93.97, 34.20)	4.10	(57,12)	3.97	(222, 9)	3.56	(185, 9)	3.44	(158, 9)	3.25	(114, 9)
44(	98.48, 17.36)	4.10	(57,12)	3.13	(232,12)	3.02	(222,12)	2.95	(128, 6)	2.79	(131, 9)
45(	100.00, 0.00)	3.56	(247,12)	2.83	(259, 9)	2.73	(278,12)	2.66	(169, 9)	2.66	(185, 9)
46(	98.48, -17.36)	4.39	(191, 9) *	4.32	(278,12)	3.41	(303, 9)	2.83	(259, 9)	2.72	(99, 9)
47(	93.97, -34.20)	3.15	(303, 9)	2.79	(191, 9)	2.72	(99, 9)	2.62	(2,12)	2.60	(162, 9)
48(	86.60, -50.00)	2.63	(224,18)	2.42	(216, 9)	2.42	(135, 9)	2.42	(241,15)	2.41	(318,15)
49(	76.60, -64.28)	2.81	(157, 6)	2.63	(224,18)	2.60	(357,12)	2.44	(309,15)	2.42	(241,15)
50(	64.28, -76.60)	2.21	(157, 6)	2.20	(135, 9)	2.14	(178, 9)	2.11	(277, 9)	1.78	(309,12)
51(	50.00, -86.60)	2.11	(277, 9)	1.74	(135, 6)	1.67	(220, 6)	1.66	(245, 6)	1.62	(189, 9)
52(	34.20, -93.97)	3.35	(317,12)	2.50	(318,12)	2.32	(202, 9)	1.86	(234, 9)	1.75	(268,12)
53(	17.36, -98.48)	2.46	(234, 9)	1.96	(318,12)	1.51	(317,12)	1.45	(230, 9)	1.45	(245, 9)
54(	0.00, -100.00)	1.49	(244,15)	1.37	(317,12)	1.34	(234, 9)	1.34	(230, 9)	1.33	(245, 9)
55(	-17.36, -98.48)	1.45	(294,12)	1.27	(300, 9)	1.20	(173, 9)	1.08	(217, 9)	0.94	(259, 9)
56(	-34.20, -93.97)	1.54	(82,12)	1.46	(176, 6)	1.45	(294,12)	1.28	(206, 9)	0.94	(259, 9)
57(	-50.00, -86.60)	1.46	(176, 6)	1.45	(294,12)	1.28	(206, 9)	0.94	(259, 9)	0.82	(138, 9)
58(	-64.28, -76.60)	1.81	(331, 9)	1.34	(208,15)	1.33	(300,12)	1.32	(35,12)	0.60	(151,21)
59(	-76.60, -64.28)	2.44	(321,12)	2.13	(266, 9)	1.97	(293,12)	1.95	(331, 9)	1.70	(208,15)
60(	-86.60, -50.00)	3.19	(321,12)	2.84	(266, 9)	2.64	(293,12)	2.59	(296,12)	2.41	(289,12)
61(	-93.97, -34.20)	4.17	(270,12)	3.36	(209,12)	2.98	(38,12)	2.76	(209,15)	2.66	(35,12)
62(	-98.48, -17.36)	3.59	(270,12)	3.12	(277,12)	2.55	(38,12)	2.44	(319,12)	2.41	(35,12)
63(	-100.00, 0.00)	2.72	(277,12)	2.07	(319,12)	1.9[illegible]	(192,12)	1.79	(265,15)	1.77	(203, 9)
	-98.48, 17.36)	3.05	(238, 9)	1.54	(176, 9)	1.	149, 9)	1.38	(203, 9)	1.26	(203,12)

65(-93.97, 34.20)	1.53 (238, 9)	1.51 (157,12)	1.39 (149, 9)	1.29 (259,12)	1.26 (158,12)
66(-86.60, 50.00)	1.51 (157,12)	1.47 (286,12)	1.43 (234,12)	1.39 (149, 9)	1.29 (259,12)
67(-76.60, 64.28)	1.84 (163,12)	1.69 (245,12)	1.61 (234,12)	1.59 (169,15)	1.58 (169,12)
68(-64.28, 76.60)	2.16 (126,15)	1.98 (163,12)	1.78 (102,12)	1.74 (169,12)	1.67 (250,12)
69(-50.00, 86.60)	2.28 (126,15)	1.69 (78,12)	1.50 (226, 9)	1.42 (277,12)	1.41 (102,12)
70(-34.20, 93.97)	2.09 (100,12)	1.73 (303,12)	1.45 (164,12)	1.26 (158,12)	1.24 (157, 9)
71(-17.36, 98.48)	2.58 (100,12)	2.45 (135, 9)	2.03 (303,12)	1.70 (301,15)	1.69 (164,12)
72(0.00, 100.00)	2.64 (135, 9)	2.45 (100, 9)	2.33 (254, 9)	2.17 (303,12)	2.17 (282,12)
73(19.33, 46.66)	2.77 (157, 9)	2.75 (303, 9)	2.43 (197, 9)	2.01 (190, 9)	1.92 (169, 9)
74(55.93, 55.93)	3.29 (132, 9)	3.29 (158, 9)	2.50 (132,12)	2.41 (222, 6)	2.40 (203, 6)
75(58.11, 24.07)	4.19 (232,12)	3.74 (158, 9)	3.73 (222, 9)	3.58 (132, 9)	3.29 (91,12)
76(-108.28, 44.85)	1.62 (238, 9)	1.45 (157,12)	1.42 (149, 9)	1.19 (259,12)	1.16 (158,12)
77(-33.02, 33.02)	1.85 (163,12)	1.38 (220,12)	1.00 (245,12)	0.99 (169,12)	0.97 (131,12)
78(-15.31, 36.96)	2.48 (158,12)	1.82 (175,12)	1.29 (100,12)	1.15 (157, 9)	1.11 (164,12)
79(0.00, 41.00)	1.60 (185, 9)	1.47 (282,12)	1.41 (303,12)	1.38 (159,15)	1.29 (254, 9)

FIVE HIGHEST 8-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	0.81 (282,16)	0.80 (185, 8)	0.77 (204, 8)	0.72 (169,16)	0.71 (159,16)
2(17.10, 46.98)	1.00 (190, 8)	0.97 (157, 8)	0.97 (303, 8)	0.90 (185, 8)	0.90 (197, 8)
3(25.00, 43.30)	1.42 (132, 8)	1.18 (197, 8)	1.13 (157, 8)	1.13 (303, 8)	0.71 (131,16)
4(32.14, 38.30)	1.50 (132, 8)	1.22 (303, 8)	1.18 (197, 8)	1.06 (191,16)	0.71 (114,16)
5(38.30, 32.14)	2.12 (132,16)	1.45 (178,16)	1.22 (158,16)	1.10 (91,16)	1.06 (191,16)
6(43.30, 25.00)	1.61 (132,16)	1.45 (178,16)	[illegible]	1.34 (237,16)	1.22 (158,16)
7(46.98, 17.10)	1.71 (57,16)	1.66 (132,16)	1.41 (232,16)	1.30 (222,16)	1.22 (149, 8)
8(49.24, 8.68)	1.71 (57,16)	1.54 (222,16)	1.41 (232,16)	1.25 (278,16)	1.22 (149, 8)
9(50.00, 0.00)	2.10 (191,16)	1.65 (163,16)	1.57 (169, 8)	1.45 (57,16)	1.45 (247,16)
10(49.24, -8.68)	2.10 (191,16) *	2.06 (278,16)	1.79 (189,16)	1.32 (247,16)	1.31 (163,16)
11(46.98, -17.10)	1.19 (247,16)	0.97 (278,16)	0.90 (191, 8)	0.83 (167, 8)	0.82 (318,16)
12(43.30, -25.00)	1.34 (268,16)	0.92 (135, 8)	0.91 (318,16)	0.81 (218,16)	0.72 (191, 8)
13(38.30, -32.14)	0.88 (157, 8)	0.87 (135, 8)	0.79 (156,16)	0.73 (201, 8)	0.71 (159,16)
14(32.14, -38.30)	0.90 (135, 8)	0.71 (156,16)	0.70 (157, 8)	0.70 (159,16)	0.61 (219,16)
15(25.00, -43.30)	0.53 (178,16)	0.47 (219,16)	0.45 (148, 8)	0.43 (229,16)	0.42 (55,16)
16(17.10, -46.98)	0.76 (202, 8)	0.66 (317,16)	0.57 (268,16)	0.50 (148, 8)	0.47 (178,16)
17(8.68, -49.24)	0.62 (244,16)	0.44 (202, 8)	0.41 (161,16)	0.41 (245, 8)	0.39 (220,16)
18(0.00, -50.00)	0.49 (244,16)	0.41 (173, 8)	0.34 (161,16)	0.32 (220,16)	0.32 (95,16)
19(-8.68, -49.24)	0.44 (173, 8)	0.43 (82,16)	0.39 (259,16)	0.39 (220,16)	0.37 (168,16)
20(-17.10, -46.98)	0.97 (82,16)	0.54 (259,16)	0.53 (206, 8)	0.50 (138, 8)	0.47 (161,16)
21(-25.00, -43.30)	0.60 (206, 8)	0.60 (259,16)	0.56 (138, 8)	0.51 (82,16)	0.51 (184,16)
22(-32.14, -38.30)	0.68 (208,16)	0.67 (300,16)	0.65 (35,16)	0.18 (293, 8)	0.18 (331, 8)
23(-38.30, -32.14)	0.88 (321,16)	0.77 (293,16)	0.72 (208,16)	0.71 (300,16)	0.70 (296,16)
24(-43.30, -25.00)	1.22 (296,16)	1.20 (209,16)	0.96 (293,16)	0.96 (321,16)	0.71 (128,16)
25(-46.98, -17.10)	2.54 (209,16)	1.31 (294,16)	1.20 (192,16)	0.95 (230,16)	0.86 (128,16)
26(-49.24, -8.68)	1.93 (209,16)	1.34 (294,16)	1.21 (277,16)	1.15 (230,16)	0.79 (192,16)
27(-50.00, 0.00)	1.10 (277,16)	0.91 (210,16)	0.81 (192,16)	0.73 (245,16)	0.70 (102,16)
28(-49.24, 8.68)	0.97 (245,16)	0.68 (203,16)	0.62 (213,16)	0.54 (215,16)	0.53 (210,16)
29(-46.98, 17.10)	0.99 (161,16)	0.85 (138,16)	0.85 (157,16)	0.81 (259,16)	0.78 (158,16)
30(-43.30, 25.00)	0.73 (202,16)	0.72 (161,16)	0.66 (163,16)	0.64 (259,16)	0.58 (286,16)
31(-38.30, 32.14)	0.79 (169,16)	0.74 (163,16)	0.58 (202,16)	0.58 (161,16)	0.43 (245,16)
32(-32.14, 38.30)	0.85 (163,16)	0.77 (169,16)	0.57 (160,16)	0.52 (258,16)	0.51 (220,16)
33(-25.00, 43.30)	0.76 (158,16)	0.75 (175,16)	0.74 (78,16)	0.73 (231,16)	0.46 (57,16)
34(-17.10, 46.98)	0.89 (158,16)	0.68 (164,16)	0.65 (100,16)	0.63 (57,16)	0.60 (204,16)
35(-8.68, 49.24)	0.79 (100,16)	0.66 (269,16)	0.65 (164,16)	0.64 (303,16)	0.59 (237,16)
36(0.00, 50.00)	0.84 (303,16)	0.78 (282,16)	0.77 (204, 8)	0.73 (185, 8)	0.69 (159,16)
37(17.36, 98.48)	1.61 (295,16)	1.21 (288,16)	1.08 (111,16)	1.05 (100, 8)	1.03 (204, 8)
38(34.20, 93.97)	1.56 (295,16)	1.55 (190, 8)	1.54 (282,16)	1.31 (132, 8)	1.01 (300,24)
39(50.00, 86.60)	1.81 (132, 8)	1.51 (282,16)	1.43 (197, 8)	1.21 (190, 8)	1.03 (301, 8)

40(64.28, 76.60)	1.86 (132, 8)	1.43 (197, 8)	1.00 (303, 8)	0.98 (222, 8)	0.98 (208,24)
41(76.60, 64.28)	1.82 (132,16)	1.46 (187,16)	1.37 (163, 8)	1.34 (222, 8)	1.15 (158, 8)
42(86.60, 50.00)	2.32 (222, 8)	1.72 (167, 8)	1.51 (158, 8)	1.51 (114, 8)	1.39 (132,16)
43(93.97, 34.20)	2.21 (57,16)	1.78 (114, 8)	1.56 (185,16)	1.48 (170,16)	1.45 (181,16)
44(98.48, 17.36)	2.21 (57,16)	1.74 (222,16)	1.53 (242,16)	1.34 (232,16)	1.31 (278,16)
45(100.00, 0.00)	2.02 (191,16)	1.93 (236,16)	1.90 (169, 8)	1.90 (247,16)	1.68 (229,16)
46(98.48, -17.36)	2.02 (191,16)	1.96 (278,16)	1.87 (189,16)	1.83 (236,16)	1.56 (247,16)
47(93.97, -34.20)	1.68 (348,16)	1.68 (147,16)	1.65 (191, 8)	1.49 (2,16)	1.27 (278,16)
48(86.60, -50.00)	1.38 (268,16)	1.26 (241,16)	1.21 (218,16)	1.18 (313,16)	1.12 (314,16)
49(76.60, -64.28)	1.26 (241,16)	1.25 (156,16)	1.25 (224,16)	1.17 (219,16)	1.12 (220, 8)
50(64.28, -76.60)	1.48 (135, 8)	1.24 (309,16)	1.00 (219,16)	0.97 (156,16)	0.86 (217,16)
51(50.00, -86.60)	1.06 (309,16)	0.96 (201, 8)	0.94 (217, 8)	0.73 (320,16)	0.73 (178,16)
52(34.20, -93.97)	1.36 (317,16)	1.27 (202, 8)	1.24 (318,16)	0.87 (217, 8)	0.86 (320,16)
53(17.36, -98.48)	0.97 (244,16)	0.90 (318,16)	0.81 (245, 8)	0.62 (317,16)	0.56 (202, 8)
54(0.00,-100.00)	0.86 (244,16)	0.63 (173, 8)	0.56 (317,16)	0.54 (90,16)	0.50 (234,16)
55(-17.36, -98.48)	0.55 (294,16)	0.48 (300, 8)	0.45 (173, 8)	0.44 (82,16)	0.38 (90,16)
56(-34.20, -93.97)	0.58 (82,16)	0.55 (176, 8)	0.55 (294,16)	0.48 (206, 8)	0.35 (259,16)
57(-50.00, -86.60)	0.55 (176, 8)	0.55 (294,16)	0.48 (206, 8)	0.41 (166, 8)	0.39 (38,16)
58(-64.28, -76.60)	0.52 (208,16)	0.50 (300,16)	0.49 (35,16)	0.48 (331, 8)	0.41 (331,16)
59(-76.60, -64.28)	0.92 (321,16)	0.74 (293,16)	0.73 (331, 8)	0.69 (208,16)	0.65 (289,16)
60(-86.60, -50.00)	1.36 (293,16)	1.24 (289,16)	1.24 (296,16)	1.20 (321,16)	1.16 (209,16)
61(-93.97, -34.20) *	2.83 (209,16)	1.68 (38,16)	1.62 (294,16)	1.58 (253,16)	1.57 (270,16)
62(-98.48, -17.36)	2.02 (209,16)	1.79 (230,16)	1.64 (253,16)	1.58 (270,16)	1.55 (294,16)
63(-100.00, 0.00)	1.16 (210,16)	1.08 (265,16)	1.05 (192,16)	1.02 (38,16)	1.02 (277,16)
64(-98.48, 17.36)	0.93 (245,16)	0.80 (238, 8)	0.80 (203,16)	0.71 (213,16)	0.62 (265,16)
65(-93.97, 34.20)	0.67 (161,16)	0.66 (157,16)	0.66 (138,16)	0.64 (243,16)	0.60 (259,16)
66(-86.60, 50.00)	0.81 (259,16)	0.70 (202,16)	0.68 (102,16)	0.66 (286,16)	0.66 (138,16)
67(-76.60, 64.28)	1.19 (169,16)	1.03 (202,16)	0.83 (163,16)	0.79 (220,16)	0.78 (131,16)
68(-64.28, 76.60)	0.98 (160,16)	0.97 (126,16)	0.94 (169,16)	0.78 (202,16)	0.74 (163,16)
69(-50.00, 86.60)	0.86 (126,16)	0.64 (175,16)	0.63 (78,16)	0.60 (231,16)	0.54 (57,16)
70(-34.20, 93.97)	0.87 (164,16)	0.78 (100,16)	0.69 (57,16)	0.65 (303,16)	0.62 (269,16)
71(-17.36, 98.48)	0.97 (100,16)	0.92 (135,16)	0.89 (303,16)	0.77 (346,16)	0.76 (269,16)
72(0.00, 100.00)	1.32 (303,16)	1.13 (111,16)	0.99 (135,16)	0.93 (204, 8)	0.92 (100, 8)
73(19.33, 46.66)	1.05 (190, 8)	1.04 (157, 8)	1.03 (303, 8)	0.91 (197, 8)	0.72 (169,16)
74(55.93, 55.93)	1.23 (132, 8)	1.23 (158,16)	1.14 (91,16)	1.03 (132,16)	0.90 (222, 8)
75(58.11, 24.07)	1.84 (132,16)	1.81 (222,16)	1.59 (232,16)	1.40 (158, 8)	1.40 (178,16)
76(-108.28, 44.85)	0.73 (243,16)	0.71 (259,16)	0.67 (157,16)	0.66 (138,16)	0.61 (238, 8)
77(-33.02, 33.02)	0.69 (163,16)	0.56 (131,16)	0.55 (169,16)	0.54 (202,16)	0.54 (220,16)
78(-15.31, 36.96)	0.93 (158,16)	0.68 (175,16)	0.48 (100,16)	0.47 (164,16)	0.46 (57,16)
79(0.00, 41.00)	0.60 (185, 8)	0.58 (303,16)	0.55 (282,16)	0.52 (159,16)	0.49 (204, 8)

FIVE HIGHEST 24-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	0.43 (204,24)	0.31 (254,24)	0.27 (282,24)	0.27 (185,24)	0.24 (169,24)
2(17.10, 46.98)	0.47 (197,24)	0.40 (190,24)	0.39 (303,24)	0.32 (157,24)	0.30 (185,24)
3(25.00, 43.30)	0.51 (132,24)	0.45 (303,24)	0.40 (197,24)	0.38 (157,24)	0.33 (131,24)
4(32.14, 38.30)	0.67 (132,24)	0.41 (303,24)	0.39 (197,24)	0.35 (191,24)	0.33 (131,24)
5(38.30, 32.14)	0.71 (132,24)	0.53 (158,24)	0.48 (178,24)	0.37 (91,24)	0.35 (191,24)
6(43.30, 25.00)	0.78 (158,24)	0.54 (132,24)	0.53 (222,24)	0.48 (178,24)	0.47 (232,24)
7(46.98, 17.10)	0.71 (185,24)	0.57 (57,24)	0.56 (222,24)	0.55 (132,24)	0.47 (232,24)
8(49.24, 8.68)	0.65 (185,24)	0.57 (57,24)	0.51 (222,24)	0.48 (232,24)	0.45 (278,24)
9(50.00, 0.00)	0.70 (191,24)	0.58 (185,24)	0.55 (163,24)	0.52 (169,24)	0.49 (57,24)
10(49.24, -8.68)	1.00 (191,24)	0.69 (278,24)	0.60 (189,24)	0.44 (247,24)	0.44 (163,24)
11(46.98, -17.10)	0.40 (247,24)	0.32 (278,24)	0.31 (162,24)	0.30 (218,24)	0.30 (191,24)
12(43.30, -25.00)	0.49 (268,24)	0.31 (135,24)	0.30 (318,24)	0.27 (218,24)	0.26 (229,24)
13(38.30, -32.14)	0.29 (157,24)	0.29 (135,24)	0.26 (156,24)	0.24 (201,24)	0.24 (159,24)
1[illegible] [illegible]2.14, -38.30)	0.30 (135,24)	0.24 (156,24)	0.2[illegible] ([illegible]7,24)	0.23 (159,24)	0.21 (219,24)

15(25.00, -43.30)	0.19 (189,24)	0.18 (178,24)	0.16 (127,24)	0.16 (228,24)	0.16 (219,24)
16(17.10, -46.98)	0.25 (202,24)	0.22 (317,24)	0.19 (268,24)	0.17 (127,24)	0.17 (148,24)
17(8.68, -49.24)	0.21 (244,24)	0.17 (234,24)	0.16 (161,24)	0.15 (202,24)	0.14 (245,24)
18(0.00, -50.00)	0.16 (244,24)	0.14 (173,24)	0.13 (217,24)	0.13 (161,24)	0.12 (121,24)
19(-8.68, -49.24)	0.15 (173,24)	0.14 (82,24)	0.14 (161,24)	0.14 (217,24)	0.13 (259,24)
20(-17.10, -46.98)	0.32 (82,24)	0.18 (259,24)	0.18 (206,24)	0.17 (138,24)	0.16 (161,24)
21(-25.00, -43.30)	0.20 (206,24)	0.20 (259,24)	0.19 (138,24)	0.17 (82,24)	0.17 (184,24)
22(-32.14, -38.30)	0.23 (208,24)	0.22 (300,24)	0.22 (35,24)	0.10 (331,24)	0.06 (293,24)
23(-38.30, -32.14)	0.29 (321,24)	0.29 (266,24)	0.26 (293,24)	0.24 (208,24)	0.24 (300,24)
24(-43.30, -25.00)	0.41 (296,24)	0.40 (209,24)	0.32 (293,24)	0.32 (321,24)	0.31 (266,24)
25(-46.98, -17.10)	0.89 (209,24)	0.44 (294,24)	0.40 (192,24)	0.37 (176,24)	0.32 (230,24)
26(-49.24, -8.68)	0.69 (209,24)	0.45 (294,24)	0.44 (176,24)	0.40 (277,24)	0.38 (230,24)
27(-50.00, 0.00)	0.37 (277,24)	0.30 (210,24)	0.28 (102,24)	0.27 (192,24)	0.24 (245,24)
28(-49.24, 8.68)	0.35 (238,24)	0.32 (245,24)	0.26 (203,24)	0.21 (213,24)	0.20 (220,24)
29(-46.98, 17.10)	0.36 (161,24)	0.31 (149,24)	0.28 (138,24)	0.28 (157,24)	0.27 (259,24)
30(-43.30, 25.00)	0.25 (161,24)	0.24 (202,24)	0.23 (163,24)	0.21 (259,24)	0.20 (220,24)
31(-38.30, 32.14)	0.26 (169,24)	0.25 (163,24)	0.19 (202,24)	0.19 (161,24)	0.15 (131,24)
32(-32.14, 38.30)	0.28 (163,24)	0.26 (169,24)	0.19 (160,24)	0.17 (258,24)	0.17 (220,24)
33(-25.00, 43.30)	0.25 (158,24)	0.25 (175,24)	0.25 (78,24)	0.24 (231,24)	0.15 (226,24)
34(-17.10, 46.98)	0.30 (158,24)	0.23 (164,24)	0.22 (100,24)	0.21 (57,24)	0.20 (204,24)
35(-8.68, 49.24)	0.26 (100,24)	0.22 (269,24)	0.22 (164,24)	0.21 (303,24)	0.20 (237,24)
36(0.00, 50.00)	0.43 (204,24)	0.29 (159,24)	0.28 (303,24)	0.27 (282,24)	0.25 (254,24)
37(17.36, 98.48)	0.68 (92,24)	0.65 (287,24)	0.61 (204,24)	0.54 (295,24)	0.53 (282,24)
38(34.20, 93.97)	0.72 (190,24)	0.66 (214,24)	0.62 (282,24)	0.61 (301,24)	0.61 (132,24)
39(50.00, 86.60)	0.84 (132,24)	0.59 (295,24)	0.57 (197,24)	0.56 (282,24)	0.52 (190,24)
40(64.28, 76.60)	0.93 (132,24)	0.55 (197,24)	0.50 (225,24)	0.49 (222,24)	0.46 (282,24)
41(76.60, 64.28)	0.74 (222,24)	0.72 (158,24)	0.68 (132,24)	0.58 (187,24)	0.52 (171,24)
42(86.60, 50.00) *	1.28 (222,24)	0.84 (158,24)	0.83 (181,24)	0.74 (246,24)	0.71 (171,24)
43(93.97, 34.20)	0.91 (185,24) *	0.91 (222,24)	0.84 (181,24)	0.79 (170,24)	0.74 (251,24)
44(98.48, 17.36)	0.74 (57,24)	0.74 (242,24)	0.72 (185,24)	0.67 (232,24)	0.61 (236,24)
45(100.00, 0.00)	0.89 (242,24)	0.87 (236,24)	0.81 (191,24)	0.69 (247,24)	0.66 (229,24)
46(98.48, -17.36)	1.19 (191,24)	0.73 (189,24)	0.73 (236,24)	0.65 (278,24)	0.59 (233,24)
47(93.97, -34.20)	0.79 (147,24)	0.67 (348,24)	0.65 (162,24)	0.62 (218,24)	0.58 (191,24)
48(86.60, -50.00)	0.68 (268,24)	0.56 (32,24)	0.54 (224,24)	0.52 (241,24)	0.52 (313,24)
49(76.60, -64.28)	0.63 (224,24)	0.57 (357,24)	0.56 (241,24)	0.47 (156,24)	0.44 (189,24)
50(64.28, -76.60)	0.49 (135,24)	0.47 (336,24)	0.45 (142,24)	0.43 (156,24)	0.43 (77,24)
51(50.00, -86.60)	0.44 (352,24)	0.38 (336,24)	0.38 (142,24)	0.38 (143,24)	0.38 (201,24)
52(34.20, -93.97)	0.48 (317,24)	0.48 (318,24)	0.47 (320,24)	0.42 (202,24)	0.36 (143,24)
53(17.36, -98.48)	0.33 (244,24)	0.32 (318,24)	0.31 (234,24)	0.27 (245,24)	0.22 (317,24)
54(0.00,-100.00)	0.29 (244,24)	0.21 (173,24)	0.20 (317,24)	0.20 (217,24)	0.19 (90,24)
55(-17.36, -98.48)	0.18 (294,24)	0.16 (300,24)	0.15 (173,24)	0.15 (82,24)	0.13 (161,24)
56(-34.20, -93.97)	0.19 (82,24)	0.18 (176,24)	0.18 (294,24)	0.16 (206,24)	0.12 (259,24)
57(-50.00, -86.60)	0.18 (176,24)	0.18 (294,24)	0.16 (206,24)	0.14 (166,24)	0.13 (38,24)
58(-64.28, -76.60)	0.30 (331,24)	0.18 (208,24)	0.17 (300,24)	0.16 (35,24)	0.10 (249,24)
59(-76.60, -64.28)	0.37 (331,24)	0.33 (289,24)	0.31 (321,24)	0.27 (266,24)	0.26 (293,24)
60(-86.60, -50.00)	0.74 (289,24)	0.50 (293,24)	0.47 (296,24)	0.42 (298,24)	0.40 (321,24)
61(-93.97, -34.20)	1.06 (209,24)	0.67 (38,24)	0.54 (294,24)	0.53 (262,24)	0.53 (253,24)
62(-98.48, -17.36)	0.81 (209,24)	0.65 (38,24)	0.60 (230,24)	0.59 (140,24)	0.55 (176,24)
63(-100.00, 0.00)	0.45 (102,24)	0.41 (38,24)	0.41 (210,24)	0.36 (277,24)	0.36 (265,24)
64(-98.48, 17.36)	0.46 (238,24)	0.34 (203,24)	0.31 (245,24)	0.24 (213,24)	0.23 (220,24)
65(-93.97, 34.20)	0.29 (149,24)	0.26 (161,24)	0.22 (138,24)	0.22 (157,24)	0.22 (243,24)
66(-86.60, 50.00)	0.28 (149,24)	0.27 (259,24)	0.24 (202,24)	0.23 (220,24)	0.23 (161,24)
67(-76.60, 64.28)	0.40 (169,24)	0.35 (202,24)	0.31 (131,24)	0.29 (160,24)	0.29 (163,24)
68(-64.28, 76.60)	0.40 (126,24)	0.34 (160,24)	0.31 (169,24)	0.29 (183,24)	0.27 (202,24)
69(-50.00, 86.60)	0.29 (126,24)	0.22 (78,24)	0.21 (175,24)	0.21 (231,24)	0.19 (226,24)
70(-34.20, 93.97)	0.29 (164,24)	0.28 (100,24)	0.23 (57,24)	0.22 (303,24)	0.21 (269,24)
71(-17.36, 98.48)	0.36 (100,24)	0.31 (128,24)	0.31 (135,24)	0.30 (346,24)	0.30 (303,24)
72(0.00, 100.00)	0.54 (282,24)	0.49 (340,24)	0.48 (204,24)	0.44 (303,24)	0.43 (92,24)
73(19.33, 46.66)	0.48 (197,24)	0.42 (190,24)	0.42 (303,24)	0.35 (157,24)	0.24 (169,24)
74(55.93, 55.93)	0.81 (132,24)	0.61 (225,24)	0.57 (158,24)	0.47 (131,24)	0.46 (197,24)

75(	58.11,	24.07)	0.87	(222,24)	0.62	(153,24)	0.61	(132,24)	0.58	(185,24)	0.57	(181,24)
76(	-108.28,	44.85)	0.27	(149,24)	0.26	(243,24)	0.24	(259,24)	0.23	(138,24)	0.22	(238,24)
77(	-33.02,	33.02)	0.23	(163,24)	0.19	(131,24)	0.18	(169,24)	0.18	(202,24)	0.18	(220,24)
78(	-15.31,	36.96)	0.31	(158,24)	0.23	(175,24)	0.16	(100,24)	0.16	(164,24)	0.15	(57,24)
79(	0.00,	41.00)	0.29	(204,24)	0.20	(159,24)	0.20	(185,24)	0.19	(303,24)	0.18	(282,24)

COMPLEX - 1972

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                COMPLEX-1 (DATED 86064)
                AN AIR QUALITY DISPERSION MODEL IN
                SECTION 4. ADDITIONAL MODELS FOR REGULATORY USE
                IN UNAMAP (VERSION 6) JULY 86.
                SOURCE: FILE 31 ON UNAMAP MAGNETIC TAPE FORM NTIS.


                              COMPLEX I  - VERSION 86064
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

                         GENERAL INPUT INFORMATION

 THIS RUN OF COMPLEX I -VERSION 86064 IS FOR THE POLLUTANT SO2  FOR 8760   1-HOUR PERIODS.
 CONCENTRATION ESTIMATES BEGIN ON HOUR- 1,JULIAN DAY-  1, YEAR-1972.
 A FACTOR OF      0.0010000 HAS BEEN SPECIFIED TO CONVERT USER LENGTH UNITS TO KILOMETERS.
  1 SIGNIFICANT SOURCES ARE TO BE CONSIDERED.
THIS RUN WILL NOT CONSIDER ANY POLLUTANT LOSS.
 HIGH-FIVE SUMMARY CONCENTRATION TABLES WILL BE OUTPUT FOR   4 AVERAGING PERIODS.
 AVG TIMES OF 1,3,8, AND 24 HOURS ARE AUTOMATICALLY DISPLAYED.
  A FACTOR OF      0.3048000 HAS BEEN SPECIFIED TO CONVERT USER HEIGHT UNITS TO METERS.

 OPTION      OPTION LIST                  OPTION SPECIFICATION : 0= IGNORE OPTION
                                                                 1= USE OPTION
                      TECHNICAL OPTIONS
    1        TERRAIN ADJUSTMENTS                                  1
    2        DO NOT INCLUDE STACK DOWNWASH CALCULATIONS           0
    3        DO NOT INCLUDE GRADUAL PLUME RISE CALCULATIONS       1
    4        CALCULATE INITIAL PLUME SIZE                         1
                      INPUT OPTIONS
    5        READ MET DATA FROM CARDS                             0
    6        READ HOURLY EMISSIONS                                0
    7        SPECIFY SIGNIFICANT SOURCES                          0
    8        READ RADIAL DISTANCES TO GENERATE RECEPTORS          1
                      PRINTED OUTPUT OPTIONS
    9        DELETE EMISSIONS WITH HEIGHT TABLE                   1
   10        DELETE MET DATA SUMMARY FOR AVG PERIOD               1
   11        DELETE HOURLY CONTRIBUTIONS                          1
   12        DELETE MET DATA ON HOURLY CONTRIBUTIONS              1
   13        DELETE FINAL PLUME RISE CALC ON HRLY CONTRIBUTIONS   1
   14        DELETE HOURLY SUMMARY                                1
   15        DELETE MET DATA ON HRLY SUMMARY                      1
   16        DELETE FINAL PLUME RISE CALC ON HRLY SUMMARY         1
   17        DELETE AVG-PERIOD CONTRIBUTIONS                      1
   18        DELETE AVERAGING PERIOD SUMMARY                      1
   19        DELETE AVG CONCENTRATIONS AND HI-5 TABLES            0
                      OTHER CONTROL AND OUTPUT OPTIONS
   20        RUN IS PART OF A SEGMENTED RUN                       0
   21        WRITE PARTIAL CONC TO DISK OR TAPE                   0
   22        WRITE HOURLY CONC TO DISK OR TAPE                    0
   23        WRITE AVG-PERIOD CONC TO DISK OR TAPE                0
   24        PUNCH AVG-PERIOD CONC ONTO CARDS                     0
   25        COMPLEX TERRAIN OPTION                               1
   26        CALM PROCESSING OPTION                               0
   27        VALLEY SCREENING OPTION                              0

ANEMOMETER HEIGHT IS:     10.00
EXPONENTS FOR POWER- LAW WIND INCREASE WITH HEIGHT ARE:0.07,0.07,0.10,0.15,0.35,0.55
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TERRAIN ADJUSTMENTS ARE: 0.500,0.500,0.500,0.500,0.000,0.000 ZMIN IS 10.0

POINT SOURCE INFORMATION

SOURCE	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	SO2(G/SEC) EMISSIONS	PART(G/SEC) EMISSIONS	STACK HT(M)	STACK TEMP(K)	STACK DIAM(M)	STACK VEL(M/SEC)	POTEN. IMPACT (MICRO G/M**3)	EFF HT(M)	GRD-LVL ELEV USER HT UNITS	BUOY FLUX F M**4/S**3
1 FLARE STACK	0.00	0.00	0.01	0.00	10.0	999.0	0.5	0.4	3.08	11.79	108.00	0.16

SIGNIFICANT SO2 POINT SOURCES

RANK	CHI-MAX (MICROGRAMS/M**3)	SOURCE NO.
1	3.08	1

ADDITIONAL INFORMATION ON SOURCES.

EMISSION INFORMATION FOR 1 (NPT) POINT SOURCES HAS BEEN INPUT
1 SIGNIFICANT POINT SOURCES(NSIGP) ARE TO BE USED FOR THIS RUN
THE ORDER OF SIGNIFICANCE(IMPS) FOR 25 OR LESS POINT SOURCES USED IN THIS RUN AS LISTED BY POINT SOURCE NUMBER:
1
SURFACE MET DATA FROM STATION(ISFCD) 14739, YEAR(ISFCYR) 1972
MIXING HEIGHT DATA FROM STATION(IMXD) 14764, YEAR(IMXYR) 1972

RECEPTOR INFORMATION

COMPLEX I INTERNALLY GENERATES 36 RECEPTORS ON A CIRCLE CORRESPONDING TO EACH NON-ZERO RADIAL DISTANCE FROM A CENTER POINT
COORDINATES ARE (USER UNITS): (0.000, 0.000)
RADIAL DISTANCE(S) USER SPECIFIED (USER UNITS): 50.000 100.000 0.000 0.000 0.000

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)
1	10,0050	8.682	49.240	0.0	115.0
2	20,0050	17.101	46.985	0.0	119.0
3	30,0050	25.000	43.301	0.0	122.0
4	40,0050	32.139	38.302	0.0	125.0
5	50,0050	38.302	32.139	0.0	127.0
6	60,0050	43.301	25.000	0.0	129.0
7	70,0050	46.985	17.101	0.0	128.0
8	80,0050	49.240	8.682	0.0	126.0
9	90,0050	50.000	0.000	0.0	123.0
10	100,0050	49.240	-8.682	0.0	121.0
11	110,0050	46.985	-17.101	0.0	116.0
12	120,0050	43.301	-25.000	0.0	118.0
13	130,0050	38.302	-32.139	0.0	117.0
14	140,0050	32.139	-38.302	0.0	113.0
15	150,0050	25.000	-43.301	0.0	106.0
16	160,0050	17.101	-46.985	0.0	108.0
17	170,0050	8.682	-49.240	0.0	102.0
18	180,0050	0.000	-50.000	0.0	99.0
19	190,0050	-8.682	-49.240	0.0	102.0
20	200,0050	-17.101	-46.985	0.0	108.0
21	210,0050	-25.000	-43.301	0.0	110.0
22	220,0050	-32.139	-38.302	0.0	112.0
23	230,0050	-38.302	-32.139	0.0	113.0
24	240,0050	-43.301	-25.000	0.0	115.0
25	250,0050	-46.985	-17.101	0.0	115.0

26	260,0050	-49.240	-8.682	0.0	113.0
27	270,0050	-50.000	0.000	0.0	110.0
28	280,0050	-49.240	8.682	0.0	105.0
29	290,0050	-46.985	17.101	0.0	103.0
30	300,0050	-43.301	25.000	0.0	97.0
31	310,0050	-38.302	32.139	0.0	92.0
32	320,0050	-32.139	38.302	0.0	96.0
33	330,0050	-25.000	43.301	0.0	103.0
34	340,0050	-17.101	46.985	0.0	108.0
35	350,0050	-8.682	49.240	0.0	111.0
36	360,0050	0.000	50.000	0.0	113.0
37	10,0100	17.365	98.481	0.0	108.0
38	20,0100	34.202	93.969	0.0	113.0
39	30,0100	50.000	86.603	0.0	120.0
40	40,0100	64.279	76.604	0.0	124.0
41	50,0100	76.604	64.279	0.0	128.0
42	60,0100	86.603	50.000	0.0	128.0
43	70,0100	93.969	34.202	0.0	128.0
44	80,0100	98.481	17.365	0.0	127.0
45	90,0100	100.000	0.000	0.0	130.0
46	100,0100	98.481	-17.365	0.0	125.0
47	110,0100	93.969	-34.202	0.0	120.0
48	120,0100	86.603	-50.000	0.0	117.0
49	130,0100	76.604	-64.279	0.0	113.0
50	140,0100	64.279	-76.604	0.0	111.0
51	150,0100	50.000	-86.603	0.0	111.0
52	160,0100	34.202	-93.969	0.0	107.0
53	170,0100	17.365	-98.481	0.0	88.0
54	180,0100	0.000	-100.000	0.0	84.0
55	190,0100	-17.365	-98.481	0.0	82.0
56	200,0100	-34.202	-93.969	0.0	82.0
57	210,0100	-50.000	-86.603	0.0	82.0
58	220,0100	-64.279	-76.604	0.0	84.0
59	230,0100	-76.604	-64.279	0.0	96.0
60	240,0100	-86.602	-50.000	0.0	108.0
61	250,0100	-93.969	-34.202	0.0	111.0
62	260,0100	-98.481	-17.365	0.0	106.0
63	270,0100	-100.000	0.000	0.0	98.0
64	280,0100	-98.481	17.365	0.0	88.0
65	290,0100	-93.969	34.202	0.0	76.0
66	300,0100	-86.603	50.000	0.0	76.0
67	310,0100	-76.605	64.279	0.0	80.0
68	320,0100	-64.279	76.604	0.0	85.0
69	330,0100	-50.000	86.602	0.0	87.0
70	340,0100	-34.202	93.969	0.0	97.0
71	350,0100	-17.365	98.481	0.0	106.0
72	360,0100	0.000	100.000	0.0	110.0
73	FENC22.5	19.330	46.660	0.0	120.0
74	FENC45.0	55.930	55.930	0.0	126.0
75	FENC67.5	58.110	24.070	0.0	130.0
76	FEN292.5	-108.280	44.850	0.0	74.0
77	FEN315.0	-33.020	33.020	0.0	94.0
78	FEN337.5	-15.310	36.960	0.0	112.0
79	FEN360.0	0.000	41.000	0.0	116.0

RECEPTORS

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)	DAY	AVG CONC FOR PERIOD 1.HR 1. TO DAY365.HR24. (MICROGRAMS/M**3)
1	10,0050	8.68	49.24	0.0	115.0		0.01
2	20,0050	17.10	46.98	0.0	119.0		0.01
3	30,0050	25.00	43.30	0.0	122.0		0.01
4	40,0050	32.14	38.30	0.0	125.0		0.01
5	50,0050	38.30	32.14	0.0	127.0		0.02
6	60,0050	43.30	25.00	0.0	129.0		0.03
7	70,0050	46.98	17.10	0.0	128.0		0.03
8	80,0050	49.24	8.68	0.0	126.0		0.03
9	90,0050	50.00	0.00	0.0	123.0		0.03
10	100,0050	49.24	-8.68	0.0	121.0		0.03
11	110,0050	46.98	-17.10	0.0	116.0		0.03
12	120,0050	43.30	-25.00	0.0	118.0		0.02
13	130,0050	38.30	-32.14	0.0	117.0		0.02
14	140,0050	32.14	-38.30	0.0	113.0		0.02
15	150,0050	25.00	-43.30	0.0	106.0		0.01
16	160,0050	17.10	-46.98	0.0	108.0		0.01
17	170,0050	8.68	-49.24	0.0	102.0		0.01
18	180,0050	0.00	-50.00	0.0	99.0		0.01
19	190,0050	-8.68	-49.24	0.0	102.0		0.01
20	200,0050	-17.10	-46.98	0.0	108.0		0.01
21	210,0050	-25.00	-43.30	0.0	110.0		0.01
22	220,0050	-32.14	-38.30	0.0	112.0		0.01
23	230,0050	-38.30	-32.14	0.0	113.0		0.01
24	240,0050	-43.30	-25.00	0.0	115.0		0.01
25	250,0050	-46.98	-17.10	0.0	115.0		0.02
26	260,0050	-49.24	-8.68	0.0	113.0		0.02
27	270,0050	-50.00	0.00	0.0	110.0		0.02
28	280,0050	-49.24	8.68	0.0	105.0		0.01
29	290,0050	-46.98	17.10	0.0	103.0		0.01
30	300,0050	-43.30	25.00	0.0	97.0		0.02
31	310,0050	-38.30	32.14	0.0	92.0		0.01
32	320,0050	-32.14	38.30	0.0	96.0		0.01
33	330,0050	-25.00	43.30	0.0	103.0		0.01
34	340,0050	-17.10	46.98	0.0	108.0		0.01
35	350,0050	-8.68	49.24	0.0	111.0		0.01
36	360,0050	0.00	50.00	0.0	113.0		0.01
37	10,0100	17.36	98.48	0.0	108.0		0.05
38	20,0100	34.20	93.97	0.0	113.0		0.06
39	30,0100	50.00	86.60	0.0	120.0		0.06
40	40,0100	64.28	76.60	0.0	124.0		0.05
41	50,0100	76.60	64.28	0.0	128.0		0.07
42	60,0100	86.60	50.00	0.0	128.0		0.09
43	70,0100	93.97	34.20	0.0	128.0		0.09
44	80,0100	98.48	17.36	0.0	127.0		0.08
45	90,0100	100.00	0.00	0.0	130.0		0.09
46	100,0100	98.48	-17.36	0.0	125.0		0.09
47	110,0100	93.97	-34.20	0.0	120.0		* 0.09
48	120,0100	86.60	-50.00	0.0	117.0		0.09
49	130,0100	76.60	-64.28	0.0	113.0		0.09
50	140,0100	64.28	-76.60	0.0	111.0		0.08
51	150,0100	50.00	-86.60	0.0	111.0		0.07
52	160,0100	34.20	-93.97	0.0	107.0		0.05
53	170,0100	17.36	-98.48	0.0	88.0		0.02
54	180,0100	0.00	-100.00	0.0	84.0		0.02

55	190,0100	-17.36	-98.48	0.0	82.0	0.01
56	200,0100	-34.20	-93.97	0.0	82.0	0.01
57	210,0100	-50.00	-86.60	0.0	82.0	0.01
58	220,0100	-64.28	-76.60	0.0	84.0	0.01
59	230,0100	-76.60	-64.28	0.0	96.0	0.03
60	240,0100	-86.60	-50.00	0.0	108.0	0.06
61	250,0100	-93.97	-34.20	0.0	111.0	0.07
62	260,0100	-98.48	-17.36	0.0	106.0	0.06
63	270,0100	-100.00	0.00	0.0	98.0	0.04
64	280,0100	-98.48	17.36	0.0	88.0	0.02
65	290,0100	-93.97	34.20	0.0	76.0	0.02
66	300,0100	-86.60	50.00	0.0	76.0	0.02
67	310,0100	-76.60	64.28	0.0	80.0	0.03
68	320,0100	-64.28	76.60	0.0	85.0	0.02
69	330,0100	-50.00	86.60	0.0	87.0	0.02
70	340,0100	-34.20	93.97	0.0	97.0	0.02
71	350,0100	-17.36	98.48	0.0	106.0	0.04
72	360,0100	0.00	100.00	0.0	110.0	0.06
73	FENC22.5	19.33	46.66	0.0	120.0	0.01
74	FENC45.0	55.93	55.93	0.0	126.0	0.04
75	FENC67.5	58.11	24.07	0.0	130.0	0.05
76	FEN292.5	-108.28	44.85	0.0	74.0	0.02
77	FEN315.0	-33.02	33.02	0.0	94.0	0.01
78	FEN337.5	-15.31	36.96	0.0	112.0	0.00
79	FEN360.0	0.00	41.00	0.0	116.0	0.01

FIVE HIGHEST 1-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	6.43 (206, 9)	6.27 (113,12)	6.15 (6,14)	5.71 (97,11)	5.71 (250,11)
2(17.10, 46.98)	6.42 (179,15)	6.21 (160, 9)	5.71 (97,11)	5.71 (277,11)	5.71 (250,11)
3(25.00, 43.30)	10.61 (119,11)	9.08 (250,10)	7.62 (179,15)	7.21 (97, 9)	5.71 (97,11)
4(32.14, 38.30)	10.61 (119,11)	10.61 (122,11)	9.74 (144, 7)	9.74 (250,10)	7.21 (97, 9)
5(38.30, 32.14)	10.61 (122,11)	9.74 (144, 7)	9.74 (278, 9)	9.74 (250,10)	5.71 (160,11)
6(43.30, 25.00)	10.95 (234, 8)	9.75 (285, 8)	9.74 (278, 9)	9.74 (191, 9)	8.45 (179,10)
7(46.98, 17.10)	10.40 (234, 8)	9.75 (285, 8)	9.74 (191, 9)	8.45 (179,10)	7.22 (58,11)
8(49.24, 8.68) *	16.13 (194, 8)	9.75 (121, 7)	9.37 (179, 9)	9.34 (181, 6)	9.30 (189, 6)
9(50.00, 0.00)	14.61 (194, 8)	10.61 (179,12)	9.55 (209, 9)	9.52 (179, 8)	9.51 (149, 8)
10(49.24, -8.68)	13.70 (226,11)	10.61 (179,12)	8.67 (180, 8)	8.66 (209, 9)	8.64 (179, 8)
11(46.98, -17.10)	11.49 (226,11)	6.78 (199, 8)	6.76 (194,10)	6.72 (194, 7)	6.71 (180, 8)
12(43.30, -25.00)	10.61 (179,13)	7.51 (194,10)	7.47 (194, 7)	7.42 (244, 7)	7.26 (55,15)
13(38.30, -32.14)	10.52 (179,13)	10.52 (186,13)	7.15 (199,10)	7.14 (194, 9)	7.13 (194,10)
14(32.14, -38.30)	9.34 (186,13)	5.75 (239,10)	5.66 (110,10)	5.55 (186,14)	4.43 (181, 7)
15(25.00, -43.30)	7.72 (190, 8)	3.86 (186,14)	3.65 (212, 8)	3.62 (292,11)	3.61 (79,14)
16(17.10, -46.98)	8.37 (190, 8)	4.05 (212, 8)	4.02 (92,10)	4.02 (292,11)	4.01 (79,14)
17(8.68, -49.24)	6.50 (205,13)	5.88 (180,12)	3.15 (205,14)	3.07 (188, 8)	2.95 (237,10)
18(0.00, -50.00)	5.83 (205,13)	5.30 (180,12)	2.63 (205,14)	2.58 (188, 8)	2.49 (237,10)
19(-8.68, -49.24)	6.50 (205,13)	3.11 (108,11)	3.07 (188, 8)	2.94 (204, 8)	2.94 (212, 9)
20(-17.10, -46.98)	4.39 (108,11)	4.25 (187,13)	4.05 (180,13)	4.01 (294,11)	3.99 (71,10)
21(-25.00, -43.30)	4.84 (204, 9)	4.78 (187,13)	4.48 (180,13)	4.43 (103, 9)	4.42 (80,11)
22(-32.14, -38.30)	9.97 (232,12)	5.50 (188, 9)	5.42 (204, 9)	4.75 (80,11)	4.75 (103, 9)
23(-38.30, -32.14)	10.31 (232,12)	5.79 (188, 9)	5.54 (210, 8)	4.75 (103, 9)	4.75 (267,10)
24(-43.30, -25.00)	6.45 (238,15)	6.41 (188, 9)	5.71 (210, 8)	5.71 (238,14)	5.00 (229, 9)
25(-46.98, -17.10)	6.45 (238,15)	6.42 (238, 9)	6.36 (238,16)	5.71 (210, 8)	5.71 (238,14)
26(-49.24, -8.68)	10.34 (204,13)	5.81 (234, 9)	5.80 (238, 9)	5.78 (187,11)	5.71 (238,16)
27(-50.00, 0.00)	9.35 (204,13)	4.96 (234,10)	4.96 (234, 9)	4.93 (187,11)	4.80 (183,13)
28(-49.24, 8.68)	3.76 (234,10)	3.48 (76,12)	3.46 (234,11)	3.46 (234,12)	3.45 (188,10)
46.98, 17.10)	7.21 (177,10)	6.07 (189,11)	3.[illegible] [illegible]39,10)	3.26 (190, 9)	3.26 (277,12)

30(-43.30, 25.00)	5.72 (177,10)	5.43 (194,12)	4.93 (191,12)	4.92 (189,11)	2.29 (190, 9)
31(-38.30, 32.14)	4.48 (194,12)	4.10 (191,12)	4.09 (148,11)	1.67 (185, 8)	1.67 (144, 8)
32(-32.14, 38.30)	4.75 (148,11)	2.17 (185, 8)	2.16 (189,10)	2.16 (229,11)	2.16 (165,10)
33(-25.00, 43.30)	3.35 (185, 8)	3.32 (165,10)	3.28 (95, 9)	3.26 (142,11)	3.26 (144, 8)
34(-17.10, 46.98)	4.30 (156, 9)	4.29 (142,11)	4.05 (253,14)	4.04 (169,15)	4.00 (103,11)
35(-8.68, 49.24)	7.83 (149,10)	5.02 (113,12)	5.02 (156, 9)	4.72 (236,10)	4.70 (144, 9)
36(0.00, 50.00)	8.30 (149,10)	5.81 (206, 9)	5.62 (113,12)	5.55 (213, 9)	5.55 (250,11)
37(17.36, 98.48)	7.70 (160, 9)	6.30 (113,12)	6.26 (6,14)	5.24 (206, 9)	4.42 (213, 9)
38(34.20, 93.97)	8.45 (160, 9)	8.44 (179,15)	5.34 (205, 7)	4.75 (359,12)	4.74 (250,11)
39(50.00, 86.60)	9.52 (179,15)	7.60 (250,10)	6.80 (144, 5)	6.58 (205, 7)	5.99 (97, 9)
40(64.28, 76.60)	7.97 (250,10)	7.97 (144, 7)	7.74 (144, 5)	5.99 (97, 9)	5.49 (122,11)
41(76.60, 64.28)	8.74 (144, 5)	7.97 (250,10)	7.97 (144, 7)	7.97 (278, 9)	7.24 (230, 6)
42(86.60, 50.00)	10.76 (234, 8)	7.97 (191, 9)	7.97 (278, 9)	7.97 (285, 8)	7.24 (191, 5)
43(93.97, 34.20)	10.76 (234, 8)	8.71 (115, 7)	7.97 (191, 9)	7.97 (285, 8)	7.24 (347,12)
44(98.48, 17.36)	10.60 (179, 9)	10.59 (181, 6)	10.57 (189, 6)	10.39 (194, 8)	8.53 (234, 6)
45(100.00, 0.00)	11.08 (179, 9) *	11.07 (181, 6)	11.06 (234, 7)	11.05 (189, 6)	10.97 (20, 9)
46(98.48, -17.36)	10.26 (234, 7)	10.17 (20, 9)	10.07 (226,11)	7.97 (180, 8)	7.97 (209, 9)
47(93.97, -34.20)	9.61 (226,11)	9.54 (190, 6)	9.38 (20, 9)	7.63 (194,10)	7.61 (194, 7)
48(86.60, -50.00)	9.07 (190, 6)	7.31 (194,10)	7.29 (194, 7)	7.28 (244, 7)	7.23 (55,15)
49(76.60, -64.28)	8.46 (190, 7)	8.40 (181, 7)	6.88 (194,10)	6.87 (239,10)	6.86 (194, 7)
50(64.28, -76.60)	8.15 (190, 7)	8.10 (181, 7)	6.66 (239,10)	6.63 (110,10)	5.22 (186,13)
51(50.00, -86.60)	8.86 (190, 8)	8.15 (190, 7)	5.01 (190,19)	4.61 (186,14)	4.51 (250, 7)
52(34.20, -93.97)	8.48 (190, 8)	7.53 (181, 8)	4.39 (190,19)	4.39 (253,13)	3.99 (250, 7)
53(17.36, -98.48)	5.05 (244, 8)	5.05 (181, 8)	4.98 (95, 7)	4.15 (205,13)	3.70 (205,14)
54(0.00,-100.00)	4.60 (244, 8)	4.59 (181, 8)	4.53 (95, 7)	3.96 (205,13)	3.41 (205,14)
55(-17.36, -98.48)	3.87 (205,13)	3.26 (108,11)	2.81 (188, 8)	2.46 (204, 8)	2.46 (212, 9)
56(-34.20, -93.97)	4.38 (206, 8)	3.83 (187,13)	3.26 (108,11)	2.46 (180,13)	2.45 (294,11)
57(-50.00, -86.60)	4.38 (206, 8)	3.85 (204, 9)	3.83 (187,13)	2.46 (180,13)	2.45 (103, 9)
58(-64.28, -76.60)	4.90 (232,12)	4.02 (204, 9)	3.41 (188, 9)	2.56 (181, 9)	2.56 (181,10)
59(-76.60, -64.28)	6.01 (229, 9)	5.65 (232,12)	4.28 (188, 9)	3.65 (210, 8)	3.17 (181, 9)
60(-86.60, -50.00)	7.66 (229, 9)	5.24 (238,15)	5.23 (188, 9)	4.42 (238,14)	4.42 (210, 8)
61(-93.97, -34.20)	6.65 (238,16)	5.48 (238,15)	5.48 (238, 9)	5.02 (199,19)	5.02 (253, 7)
62(-98.48, -17.36)	7.39 (209,10)	7.29 (91, 7)	6.28 (204,13)	6.12 (238,16)	6.12 (183,13)
63(-100.00, 0.00)	6.29 (209,10)	6.20 (91, 7)	5.78 (204,13)	5.30 (183,13)	4.44 (234,10)
64(-98.48, 17.36)	5.05 (209,10)	4.32 (76,12)	3.69 (234,10)	2.76 (234,11)	2.76 (234,12)
65(-93.97, 34.20)	4.41 (177,10)	3.76 (142, 9)	3.75 (109,11)	3.70 (80,10)	3.35 (200, 9)
66(-86.60, 50.00)	4.41 (177,10)	3.78 (194, 6)	3.76 (142, 9)	3.75 (109,11)	3.70 (80,10)
67(-76.60, 64.28)	4.17 (194, 6)	3.78 (194,12)	3.66 (189, 9)	3.66 (189, 8)	3.66 (189, 7)
68(-64.28, 76.60)	4.08 (189, 9)	4.08 (189, 7)	4.05 (20,10)	3.48 (185, 8)	3.48 (189,10)
69(-50.00, 86.60)	4.26 (189, 7)	4.23 (20,10)	3.62 (185, 8)	3.61 (165,10)	3.60 (95, 9)
70(-34.20, 93.97)	3.71 (156, 9)	3.71 (142,11)	3.22 (253,14)	3.22 (169,15)	3.21 (103,11)
71(-17.36, 98.48)	7.36 (277,10)	7.28 (58,13)	6.09 (113,12)	4.32 (222, 5)	4.29 (156, 9)
72(0.00, 100.00)	7.94 (277,10)	7.86 (58,13)	6.51 (113,12)	6.47 (6,14)	5.40 (206, 9)
73(19.33, 46.66)	6.95 (179,15)	6.72 (160, 9)	5.77 (97,11)	5.77 (277,11)	4.80 (97,10)
74(55.93, 55.93)	9.86 (144, 7)	9.86 (278, 9)	9.86 (250,10)	7.51 (122,11)	7.51 (119,11)
75(58.11, 24.07)	13.57 (234, 8)	10.73 (285, 8)	10.73 (191, 9)	8.02 (109,15)	8.02 (180, 9)
76(-108.28, 44.85)	3.99 (142, 9)	3.99 (109,11)	3.95 (80,10)	3.88 (177,10)	3.33 (200, 9)
77(-33.02, 33.02)	4.04 (148,11)	1.51 (144, 8)	1.50 (121, 8)	1.50 (127,10)	1.49 (204,12)
78(-15.31, 36.96)	3.46 (156, 9)	3.45 (142,11)	3.25 (95, 9)	3.22 (103,11)	3.22 (169,15)
79(0.00, 41.00)	8.10 (149,10)	4.80 (206, 9)	4.18 (113,12)	4.13 (250,11)	4.13 (213, 9)

FIVE HIGHEST 3-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	2.14 (206, 9)	2.09 (113,12)	2.05 (6,15)	1.90 (97,12)	1.90 (250,12)
2(17.10, 46.98)	3.49 (97,12)	2.14 (179,15)	2.09 (252, 9)	2.07 (160, 9)	1.97 (185,12)
3(25.00, 43.30)	3.54 (119,12)	3.49 (97,12)	3.03 (250,12)	2.54 (179,15)	2.40 (97, 9)
4(32.14, 38.30)	3.54 (119,12)	3.54 (122,12)	3.25 (144, 9)	3.25 (250,12)	2.40 (97, 9)

5(38.30, 32.14)	3.54 (122,12)	3.25 (144, 9)	3.25 (278, 9)	3.25 (250,12)	2.93 (180,12)
6(43.30, 25.00)	3.82 (160,12)	3.65 (155, 9)	3.65 (234, 9)	3.25 (278, 9)	3.25 (285, 9)
7(46.98, 17.10)	4.31 (58,12)	3.81 (160,12)	3.47 (234, 9)	3.28 (235,12)	3.25 (285, 9)
8(49.24, 8.68)	5.38 (194, 9)	4.31 (58,12)	3.70 (179, 9)	3.50 (121, 9)	3.49 (109,12)
9(50.00, 0.00)	6.40 (179, 9) *	5.07 (149, 9)	4.89 (179,12)	4.87 (194, 9)	4.31 (58,12)
10(49.24, -8.68)	4.57 (226,12)	3.57 (97, 9)	3.54 (179,12)	3.46 (180, 9)	2.89 (209, 9)
11(46.98, -17.10)	3.83 (226,12)	2.93 (207, 9)	2.82 (97, 9)	2.26 (199, 9)	2.25 (194,12)
12(43.30, -25.00)	4.89 (194, 9)	3.54 (179,15)	2.76 (120,12)	2.57 (190, 6)	2.50 (194,12)
13(38.30, -32.14)	4.74 (194, 9)	3.51 (179,15)	3.51 (186,15)	2.38 (199,12)	2.38 (249, 9)
14(32.14, -38.30)	5.24 (186,15)	1.93 (249,12)	1.92 (239,12)	1.89 (110,12)	1.70 (79,12)
15(25.00, -43.30)	3.49 (190, 9)	1.55 (186,15)	1.48 (79,15)	1.41 (232, 9)	1.22 (212, 9)
16(17.10, -46.98)	2.79 (190, 9)	1.67 (79,15)	1.56 (267, 9)	1.35 (212, 9)	1.34 (92,12)
17(8.68, -49.24)	3.22 (205,15)	1.96 (180,12)	1.90 (186,12)	1.10 (267, 9)	1.02 (188, 9)
18(0.00, -50.00)	2.82 (205,15)	1.77 (180,12)	0.96 (218, 9)	0.95 (159,12)	0.93 (188, 9)
19(-8.68, -49.24)	2.17 (205,15)	1.15 (294,12)	1.15 (159,12)	1.13 (188, 9)	1.04 (108,12)
20(-17.10, -46.98)	1.67 (294,12)	1.46 (108,12)	1.42 (206, 9)	1.42 (187,15)	1.35 (180,15)
21(-25.00, -43.30)	1.99 (187,15)	1.66 (118, 9)	1.62 (206, 9)	1.61 (204, 9)	1.49 (180,15)
22(-32.14, -38.30)	3.32 (232,12)	3.04 (181,12)	1.83 (188, 9)	1.81 (204, 9)	1.58 (103, 9)
23(-38.30, -32.14)	3.44 (232,12)	2.25 (210, 9)	1.93 (188, 9)	1.89 (257,12)	1.86 (181,12)
24(-43.30, -25.00)	5.40 (238,15)	2.70 (218,12)	2.14 (188, 9)	1.90 (210, 9)	1.89 (257,12)
25(-46.98, -17.10)	5.40 (238,15)	3.27 (201,12)	2.70 (218,12)	2.70 (238,12)	2.14 (238, 9)
26(-49.24, -8.68)	3.51 (187,12)	3.45 (204,15)	3.24 (201,12)	3.16 (234,12)	3.01 (238,12)
27(-50.00, 0.00)	4.64 (234,12)	3.13 (187,12)	3.12 (204,15)	2.70 (201,12)	2.70 (201,15)
28(-49.24, 8.68)	3.56 (234,12)	1.39 (80,15)	1.33 (210,12)	1.16 (76,12)	1.15 (188,12)
29(-46.98, 17.10)	3.26 (177,12)	2.02 (189,12)	1.23 (222,12)	1.22 (80,15)	1.15 (127,12)
30(-43.30, 25.00)	2.52 (177,12)	2.29 (189,12)	1.91 (194,12)	1.64 (191,12)	1.43 (127, 9)
31(-38.30, 32.14)	1.82 (148,12)	1.59 (278,12)	1.51 (189, 9)	1.49 (194,12)	1.37 (191,12)
32(-32.14, 38.30)	1.58 (148,12)	1.44 (244,12)	1.38 (191,12)	1.34 (278,12)	1.32 (189, 9)
33(-25.00, 43.30)	2.12 (142,12)	2.07 (191,12)	1.98 (103,12)	1.95 (156,12)	1.83 (204,12)
34(-17.10, 46.98)	1.43 (156, 9)	1.43 (142,12)	1.35 (253,15)	1.35 (169,15)	1.33 (103,12)
35(-8.68, 49.24)	2.61 (149,12)	2.10 (199,12)	1.75 (213,12)	1.67 (113,12)	1.67 (156, 9)
36(0.00, 50.00)	2.77 (149,12)	2.10 (199,12)	1.94 (206, 9)	1.87 (113,12)	1.85 (213, 9)
37(17.36, 98.48)	2.57 (160, 9)	2.10 (113,12)	2.09 (6,15)	2.01 (185,12)	1.97 (196,18)
38(34.20, 93.97)	3.06 (252, 9)	2.90 (97,12)	2.82 (160, 9)	2.81 (179,15)	2.75 (185,12)
39(50.00, 86.60)	3.17 (179,15)	2.92 (97,12)	2.53 (250,12)	2.34 (236, 9)	2.27 (144, 6)
40(64.28, 76.60)	2.66 (250,12)	2.66 (144, 9)	2.58 (144, 6)	2.34 (236, 9)	2.00 (97, 9)
41(76.60, 64.28)	3.36 (236, 9)	2.91 (144, 6)	2.77 (213, 9)	2.66 (250,12)	2.66 (144, 9)
42(86.60, 50.00)	3.76 (155, 9)	3.66 (160,12)	3.59 (234, 9)	3.01 (278, 9)	2.79 (199, 9)
43(93.97, 34.20)	3.59 (58,12)	3.59 (234, 9)	3.36 (235,12)	3.25 (324,12)	3.19 (160,12)
44(98.48, 17.36)	4.97 (179, 9)	3.59 (58,12)	3.53 (181, 6)	3.52 (189, 6)	3.46 (194, 9)
45(100.00, 0.00) *	7.79 (179, 9)	4.25 (149, 9)	3.69 (181, 6)	3.69 (234, 9)	3.68 (189, 6)
46(98.48, -17.36)	4.46 (97, 9)	4.10 (180, 9)	3.80 (20, 9)	3.42 (234, 9)	3.36 (226,12)
47(93.97, -34.20)	5.37 (190, 6)	4.33 (97, 9)	3.53 (20, 9)	3.20 (226,12)	2.72 (54,15)
48(86.60, -50.00)	5.03 (190, 6)	4.42 (194, 9)	2.72 (54,15)	2.48 (178,18)	2.44 (194,12)
49(76.60, -64.28)	4.17 (194, 9)	3.06 (249, 9)	3.01 (243, 9)	2.82 (190, 9)	2.80 (181, 9)
50(64.28, -76.60)	3.99 (186,15)	2.85 (243, 9)	2.72 (190, 9)	2.70 (181, 9)	2.68 (42,15)
51(50.00, -86.60)	5.67 (190, 9)	2.26 (186,15)	2.22 (79,15)	1.94 (232, 9)	1.80 (239, 9)
52(34.20, -93.97)	2.83 (190, 9)	2.51 (181, 9)	2.12 (79,15)	1.89 (267, 9)	1.73 (58, 9)
53(17.36, -98.48)	2.62 (205,15)	1.85 (186,12)	1.68 (244, 9)	1.68 (181, 9)	1.66 (95, 9)
54(0.00,-100.00)	2.46 (205,15)	1.57 (188, 9)	1.53 (244, 9)	1.53 (181, 9)	1.51 (95, 9)
55(-17.36, -98.48)	1.50 (304,12)	1.49 (188, 9)	1.31 (159,12)	1.29 (205,15)	1.20 (294,12)
56(-34.20, -93.97)	1.87 (206, 9)	1.28 (187,15)	1.20 (294,12)	1.09 (108,12)	1.05 (304,12)
57(-50.00, -86.60)	1.87 (206, 9)	1.77 (187,15)	1.28 (204, 9)	1.07 (118, 9)	1.05 (304,12)
58(-64.28, -76.60)	1.88 (181,12)	1.63 (232,12)	1.54 (322,12)	1.34 (204, 9)	1.14 (188, 9)
59(-76.60, -64.28)	2.00 (229, 9)	1.90 (210, 9)	1.88 (232,12)	1.63 (257,12)	1.59 (181,12)
60(-86.60, -50.00)	4.33 (238,15)	2.55 (229, 9)	2.36 (322,15)	2.23 (218,12)	2.20 (311,12)
61(-93.97, -34.20)	4.50 (238,15)	3.61 (201,12)	2.45 (177,15)	2.36 (311,12)	2.27 (238,12)
62(-98.48, -17.36)	3.33 (201,12)	2.98 (238, 9)	2.94 (238,12)	2.92 (187,12)	2.47 (234,12)
63(-100.00, 0.00)	3.67 (234,12)	2.57 (187,12)	2.24 (91, 9)	2.10 (209,12)	2.05 (143,12)
-98.48, 17.36)	3.07 (234,12)	1.68 (209,12)	1.[illegible] 76,12)	1.39 (80,15)	1.30 (201, 9)

65(-93.97, 34.20)	2.00 (177,12)	1.25 (142, 9)	1.25 (109,12)	1.23 (80,12)	1.12 (200, 9)
66(-86.60, 50.00)	2.00 (177,12)	1.84 (127, 9)	1.58 (189,12)	1.41 (194,12)	1.37 (278,12)
67(-76.60, 64.28)	3.66 (189, 9)	2.28 (278,12)	2.00 (127, 9)	1.84 (244,12)	1.67 (189,12)
68(-64.28, 76.60)	2.72 (189, 9)	2.07 (244,12)	1.77 (20,12)	1.75 (95, 9)	1.74 (191,12)
69(-50.00, 86.60)	1.94 (142,12)	1.85 (95, 9)	1.81 (191,12)	1.69 (103,12)	1.62 (156,12)
70(-34.20, 93.97)	1.24 (252,15)	1.24 (156, 9)	1.24 (142,12)	1.17 (83,18)	1.15 (175,15)
71(-17.36, 98.48)	2.45 (277,12)	2.43 (58,15)	2.07 (268, 9)	2.03 (113,12)	2.02 (213,12)
72(0.00, 100.00)	2.65 (277,12)	2.62 (58,15)	2.17 (113,12)	2.16 (6,15)	2.01 (196,18)
73(19.33, 46.66)	3.52 (97,12)	2.32 (179,15)	2.24 (160, 9)	2.14 (252, 9)	1.92 (277,12)
74(55.93, 55.93)	3.37 (184,15)	3.29 (144, 9)	3.29 (278, 9)	3.29 (250,12)	3.04 (180,12)
75(58.11, 24.07)	4.52 (234, 9)	4.26 (160,12)	3.95 (235,12)	3.64 (70,12)	3.58 (285, 9)
76(-108.28, 44.85)	1.77 (177,12)	1.33 (142, 9)	1.33 (109,12)	1.32 (80,12)	1.27 (194,12)
77(-33.02, 33.02)	1.78 (148,12)	1.46 (278,12)	1.28 (189, 9)	1.02 (244,12)	0.99 (191,12)
78(-15.31, 36.96)	1.15 (156, 9)	1.15 (142,12)	1.08 (95, 9)	1.07 (103,12)	1.07 (169,15)
79(0.00, 41.00)	2.70 (149,12)	1.60 (206, 9)	1.50 (199,12)	1.39 (113,12)	1.38 (250,12)

FIVE HIGHEST 8-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	0.80 (206,16)	0.79 (113,16)	0.77 (6,16)	0.72 (213,16)	0.71 (97,16)
2(17.10, 46.98)	1.31 (97,16)	0.80 (179,16)	0.78 (160,16)	0.74 (185,16)	0.71 (277,16)
3(25.00, 43.30)	2.21 (97,16)	1.33 (119,16)	1.13 (250,16)	0.95 (179,16)	0.91 (150,16)
4(32.14, 38.30)	1.47 (144, 8)	1.33 (119,16)	1.33 (122,16)	1.22 (250,16)	0.90 (97,16)
5(38.30, 32.14)	1.53 (144, 8)	1.33 (122,16)	1.31 (226,16)	1.22 (278,16)	1.22 (250,16)
6(43.30, 25.00)	1.96 (179,16)	1.49 (180,16)	1.46 (155,16)	1.43 (160,16)	1.37 (234, 8)
7(46.98, 17.10)	1.96 (179,16)	1.81 (70,16)	1.62 (58,16)	1.46 (155,16)	1.43 (160,16)
8(49.24, 8.68)	2.21 (109,16)	2.02 (194, 8)	1.79 (58,16)	1.68 (179,16)	1.36 (235,16)
9(50.00, 0.00)	2.83 (179,16)	1.90 (109,16)	1.83 (194, 8)	1.79 (58,16)	1.62 (179, 8)
10(49.24, -8.68)	2.22 (226,16)	1.35 (97, 8)	1.33 (179,16)	1.30 (180, 8)	1.25 (191, 8)
11(46.98, -17.10)	1.94 (226,16)	1.33 (55,16)	1.06 (97, 8)	0.92 (249,16)	0.85 (199, 8)
12(43.30, -25.00)	1.84 (194,16)	1.43 (249,16)	1.41 (55,16)	1.33 (179,16)	1.04 (120,16)
13(38.30, -32.14)	1.78 (194,16)	1.44 (249,16)	1.32 (179,16)	1.31 (186,16)	0.89 (199,16)
14(32.14, -38.30)	2.17 (186,16)	0.87 (79,16)	0.85 (239,16)	0.84 (249,16)	0.71 (42,16)
15(25.00, -43.30)	1.31 (190, 8)	1.16 (186,16)	0.98 (79,16)	0.53 (232,16)	0.46 (212, 8)
16(17.10, -46.98)	1.05 (190, 8)	0.63 (92,16)	0.63 (292,16)	0.63 (79,16)	0.61 (186,16)
17(8.68, -49.24)	1.21 (205,16)	0.74 (180,16)	0.71 (186,16)	0.38 (188, 8)	0.37 (237,16)
18(0.00, -50.00)	1.06 (205,16)	0.71 (180,16)	0.36 (218, 8)	0.36 (294,16)	0.35 (159,16)
19(-8.68, -49.24)	0.81 (205,16)	0.50 (294,16)	0.43 (159,16)	0.43 (71,16)	0.42 (188, 8)
20(-17.10, -46.98)	0.63 (294,16)	0.62 (71,16)	0.55 (108,16)	0.54 (206, 8)	0.53 (187,16)
21(-25.00, -43.30)	0.75 (187,16)	0.61 (206, 8)	0.61 (204,16)	0.56 (180,16)	0.55 (103,16)
22(-32.14, -38.30)	2.05 (181,16)	1.25 (232,16)	0.77 (80,16)	0.69 (188,16)	0.68 (204,16)
23(-38.30, -32.14)	1.61 (181,16)	1.29 (232,16)	0.84 (210, 8)	0.82 (257,16)	0.72 (188,16)
24(-43.30, -25.00)	2.03 (238,16)	1.52 (218,16)	0.82 (257,16)	0.80 (188,16)	0.71 (210, 8)
25(-46.98, -17.10) *	4.64 (238,16)	1.73 (201,16)	1.01 (218,16)	0.95 (251,16)	0.72 (257,16)
26(-49.24, -8.68)	2.57 (238,16)	2.43 (201,16)	1.91 (234,16)	1.32 (187,16)	1.29 (204,16)
27(-50.00, 0.00)	2.36 (234,16)	2.18 (201,16)	1.18 (187,16)	1.17 (204,16)	1.12 (210,16)
28(-49.24, 8.68)	1.33 (234,16)	0.86 (76,16)	0.85 (210,16)	0.71 (190,16)	0.59 (267,16)
29(-46.98, 17.10)	1.22 (177,16)	1.10 (189,16)	0.81 (80,16)	0.78 (139,16)	0.77 (76,16)
30(-43.30, 25.00)	1.11 (189,16)	0.95 (177,16)	0.72 (194,16)	0.66 (191,16)	0.57 (278,16)
31(-38.30, 32.14)	0.70 (148,16)	0.68 (191,16)	0.66 (244,16)	0.61 (165,16)	0.60 (229,16)
32(-32.14, 38.30)	0.87 (244,16)	0.74 (191,16)	0.71 (188,16)	0.59 (148,16)	0.55 (142,16)
33(-25.00, 43.30)	0.80 (142,16)	0.78 (191,16)	0.74 (103,16)	0.73 (156,16)	0.69 (204,16)
34(-17.10, 46.98)	0.63 (169,16)	0.54 (156,16)	0.54 (142,16)	0.51 (253,16)	0.50 (103,16)
35(-8.68, 49.24)	0.98 (149,16)	0.79 (199,16)	0.76 (165,16)	0.73 (285,16)	0.70 (144,16)
36(0.00, 50.00)	1.20 (213,16)	1.04 (149,16)	1.01 (185,16)	0.79 (199,16)	0.73 (206,16)
37(17.36, 98.48)	1.10 (160,16)	0.88 (113,16)	0.85 (172,16)	0.84 (185,16)	0.78 (6,16)
38(34.20, 93.97)	1.36 (160,16)	1.33 (185,16)	1.09 (97,16)	1.06 (179,16)	1.04 (135, 8)
39(50.00, 86.60)	1.84 (97,16)	1.34 (150,16)	1.19 (179,16)	0.95 (250,16)	0.90 (270,16)

40(64.28, 76.60)	1.96 (144, 8)	1.00 (250,16)	0.94 (148, 8)	0.81 (236,16)	0.77 (150,16)
41(76.60, 64.28)	2.09 (144, 8)	1.44 (213, 8)	1.27 (230, 8)	1.10 (226,16)	1.08 (43,16)
42(86.60, 50.00)	1.46 (160,16)	1.37 (155, 8)	1.36 (113,16)	1.35 (234, 8)	1.30 (179,16)
43(93.97, 34.20)	1.60 (235,16)	1.52 (70,16)	1.51 (179,16)	1.36 (113,16)	1.35 (234, 8)
44(98.48, 17.36)	1.97 (179,16)	1.84 (109,16)	1.80 (58,16)	1.65 (191, 8)	1.65 (193,16)
45(100.00, 0.00)	2.55 (234, 8) *	2.50 (179,16)	2.08 (179, 8)	1.80 (58,16)	1.65 (191, 8)
46(98.48, -17.36)	1.99 (97, 8)	1.79 (226,16)	1.65 (191, 8)	1.54 (180, 8)	1.43 (1,16)
47(93.97, -34.20)	2.01 (190, 8)	1.93 (97, 8)	1.63 (226,16)	1.51 (54,16)	1.48 (55,16)
48(86.60, -50.00)	1.88 (190, 8)	1.66 (194,16)	1.66 (54,16)	1.57 (249,16)	1.34 (6,16)
49(76.60, -64.28)	1.59 (249,16)	1.57 (194,16)	1.42 (242,16)	1.29 (6,16)	1.24 (42,16)
50(64.28, -76.60)	2.09 (42,16)	2.00 (186,16)	1.44 (6,16)	1.37 (79,16)	1.30 (249,16)
51(50.00, -86.60)	2.13 (190, 8)	2.02 (186,16)	1.26 (79,16)	1.16 (42,16)	0.75 (41,16)
52(34.20, -93.97)	1.06 (190, 8)	0.94 (181, 8)	0.90 (186,16)	0.87 (292,16)	0.81 (253,16)
53(17.36, -98.48)	0.98 (205,16)	0.69 (186,16)	0.63 (244, 8)	0.63 (181, 8)	0.62 (95, 8)
54(0.00,-100.00)	0.92 (205,16)	0.62 (188, 8)	0.57 (244, 8)	0.57 (181, 8)	0.57 (95, 8)
55(-17.36, -98.48)	0.60 (294,16)	0.58 (188, 8)	0.56 (304,16)	0.50 (205,16)	0.49 (159,16)
56(-34.20, -93.97)	0.75 (206, 8)	0.49 (187,16)	0.45 (294,16)	0.45 (71,16)	0.41 (108,16)
57(-50.00, -86.60)	0.72 (206, 8)	0.69 (187,16)	0.48 (204,16)	0.40 (304,16)	0.31 (311,16)
58(-64.28, -76.60)	1.44 (181,16)	0.61 (232,16)	0.58 (322,16)	0.50 (204,16)	0.50 (80,16)
59(-76.60, -64.28)	1.64 (181,16)	0.83 (257,16)	0.79 (322,16)	0.75 (229,16)	0.71 (210, 8)
60(-86.60, -50.00)	1.63 (238,16)	1.29 (322,16)	1.25 (218,16)	1.08 (257,16)	1.03 (262,16)
61(-93.97, -34.20)	4.06 (238,16)	1.78 (201,16)	1.53 (177,16)	1.42 (251,16)	1.35 (279,16)
62(-98.48, -17.36)	2.50 (238,16)	2.49 (201,16)	1.59 (251,16)	1.58 (200,16)	1.56 (234,16)
63(-100.00, 0.00)	1.93 (234,16)	1.78 (201,16)	1.15 (210,16)	0.98 (200,16)	0.97 (245,16)
64(-98.48, 17.36)	1.15 (234,16)	0.88 (76,16)	0.74 (210,16)	0.72 (211,16)	0.66 (267,16)
65(-93.97, 34.20)	0.95 (80,16)	0.75 (177,16)	0.70 (76,16)	0.61 (189,16)	0.60 (139,16)
66(-86.60, 50.00)	0.84 (80,16)	0.82 (189,16)	0.75 (177,16)	0.63 (278,16)	0.61 (144,16)
67(-76.60, 64.28)	1.21 (244,16)	1.10 (189,16)	1.06 (165,16)	1.01 (229,16)	0.92 (189, 8)
68(-64.28, 76.60)	1.37 (244,16)	0.95 (189,16)	0.90 (165,16)	0.89 (188,16)	0.89 (191,16)
69(-50.00, 86.60)	0.73 (142,16)	0.68 (191,16)	0.64 (103,16)	0.61 (156,16)	0.56 (169,16)
70(-34.20, 93.97)	0.70 (169,16)	0.66 (252,16)	0.46 (156,16)	0.46 (142,16)	0.46 (222, 8)
71(-17.36, 98.48)	1.02 (165,16)	0.94 (285,16)	0.92 (277,16)	0.91 (58,16)	0.78 (297, 8)
72(0.00, 100.00)	1.09 (296,24)	1.02 (297, 8)	0.99 (213,16)	0.99 (277,16)	0.98 (58,16)
73(19.33, 46.66)	1.32 (97,16)	0.87 (179,16)	0.85 (160,16)	0.72 (277,16)	0.62 (252,16)
74(55.93, 55.93)	2.12 (144, 8)	1.40 (150,16)	1.26 (184,16)	1.23 (278,16)	1.23 (250,16)
75(58.11, 24.07)	2.60 (70,16)	1.98 (179,16)	1.70 (234, 8)	1.67 (235,16)	1.63 (155,16)
76(-108.28, 44.85)	0.99 (80,16)	0.70 (76,16)	0.67 (177,16)	0.64 (142,16)	0.62 (190,16)
77(-33.02, 33.02)	0.67 (148,16)	0.60 (244,16)	0.56 (165,16)	0.55 (229,16)	0.55 (278,16)
78(-15.31, 36.96)	0.73 (156,16)	0.46 (169,16)	0.43 (142,16)	0.41 (95,16)	0.40 (103,16)
79(0.00, 41.00)	1.01 (149,16)	0.88 (213,16)	0.73 (185,16)	0.60 (206,16)	0.56 (199,16)

FIVE HIGHEST 24-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	0.27 (206,24)	0.26 (113,24)	0.26 (6,24)	0.24 (213,24)	0.24 (97,24)
2(17.10, 46.98)	0.44 (97,24)	0.30 (252,24)	0.27 (179,24)	0.26 (160,24)	0.25 (185,24)
3(25.00, 43.30)	0.74 (97,24)	0.44 (119,24)	0.38 (250,24)	0.32 (179,24)	0.31 (236,24)
4(32.14, 38.30)	0.49 (144,24)	0.44 (119,24)	0.44 (122,24)	0.44 (155,24)	0.41 (250,24)
5(38.30, 32.14)	0.51 (144,24)	0.49 (155,24)	0.44 (122,24)	0.44 (226,24)	0.41 (150,24)
6(43.30, 25.00)	0.82 (155,24)	0.65 (179,24)	0.57 (180,24)	0.55 (160,24)	0.54 (191,24)
7(46.98, 17.10)	0.66 (179,24)	0.60 (70,24)	0.59 (155,24)	0.55 (160,24)	0.54 (58,24)
8(49.24, 8.68)	0.74 (109,24)	0.71 (194,24)	0.71 (179,24)	0.60 (58,24)	0.52 (121,24)
9(50.00, 0.00)	1.48 (179,24)	0.64 (234,24)	0.63 (149,24)	0.63 (109,24)	0.61 (194,24)
10(49.24, -8.68)	0.80 (179,24)	0.78 (226,24)	0.51 (234,24)	0.45 (97,24)	0.43 (180,24)
11(46.98, -17.10)	0.65 (226,24)	0.56 (194,24)	0.44 (55,24)	0.37 (207,24)	0.36 (97,24)
12(43.30, -25.00)	0.92 (194,24)	0.48 (249,24)	0.47 (55,24)	0.44 (179,24)	0.35 (120,24)
13(38.30, -32.14)	0.89 (194,24)	0.54 (249,24)	0.47 (186,24)	0.44 (179,24)	0.34 (239,24)
14(32.14, -38.30)	0.76 (186,24)	0.34 (249,24)	0.33 (79,24)	0.28 (239,24)	0.25 (232,24)

15(25.00, -43.30)		0.46	(190,24)	0.39	(186,24)	0.36	(79,24)	0.21	(232,24)	0.15	(292,24)
16(17.10, -46.98)		0.38	(190,24)	0.21	(79,24)	0.21	(292,24)	0.21	(92,24)	0.21	(186,24)
17(8.68, -49.24)		0.40	(205,24)	0.25	(180,24)	0.24	(186,24)	0.14	(267,24)	0.13	(188,24)
18(0.00, -50.00)		0.35	(205,24)	0.24	(180,24)	0.12	(218,24)	0.12	(294,24)	0.12	(159,24)
19(-8.68, -49.24)		0.27	(205,24)	0.17	(294,24)	0.14	(159,24)	0.14	(71,24)	0.14	(188,24)
20(-17.10, -46.98)		0.21	(294,24)	0.21	(71,24)	0.18	(108,24)	0.18	(206,24)	0.18	(187,24)
21(-25.00, -43.30)		0.25	(187,24)	0.21	(118,24)	0.20	(206,24)	0.20	(204,24)	0.19	(180,24)
22(-32.14, -38.30)		0.68	(181,24)	0.42	(232,24)	0.26	(80,24)	0.23	(188,24)	0.23	(204,24)
23(-38.30, -32.14)		0.54	(181,24)	0.43	(232,24)	0.28	(210,24)	0.27	(257,24)	0.24	(188,24)
24(-43.30, -25.00)		0.68	(238,24)	0.51	(218,24)	0.27	(257,24)	0.27	(188,24)	0.24	(210,24)
25(-46.98, -17.10)		1.55	(238,24)	0.58	(201,24)	0.34	(218,24)	0.32	(251,24)	0.24	(257,24)
26(-49.24, -8.68)		0.92	(238,24)	0.81	(201,24)	0.64	(234,24)	0.64	(187,24)	0.43	(204,24)
27(-50.00, 0.00)		0.79	(234,24)	0.73	(201,24)	0.39	(187,24)	0.39	(204,24)	0.37	(210,24)
28(-49.24, 8.68)		0.44	(234,24)	0.29	(76,24)	0.28	(210,24)	0.24	(190,24)	0.20	(267,24)
29(-46.98, 17.10)		0.41	(177,24)	0.37	(189,24)	0.27	(80,24)	0.26	(139,24)	0.26	(76,24)
30(-43.30, 25.00)		0.46	(189,24)	0.32	(177,24)	0.30	(194,24)	0.22	(191,24)	0.19	(278,24)
31(-38.30, 32.14)		0.32	(189,24)	0.23	(148,24)	0.23	(194,24)	0.23	(191,24)	0.23	(244,24)
32(-32.14, 38.30)		0.29	(244,24)	0.26	(189,24)	0.25	(191,24)	0.24	(188,24)	0.20	(148,24)
33(-25.00, 43.30)		0.27	(142,24)	0.26	(191,24)	0.25	(103,24)	0.24	(156,24)	0.23	(204,24)
34(-17.10, 46.98)		0.21	(169,24)	0.18	(156,24)	0.18	(142,24)	0.17	(253,24)	0.17	(103,24)
35(-8.68, 49.24)		0.33	(149,24)	0.30	(165,24)	0.26	(199,24)	0.24	(285,24)	0.23	(144,24)
36(0.00, 50.00)		0.40	(213,24)	0.35	(149,24)	0.34	(185,24)	0.26	(199,24)	0.25	(165,24)
37(17.36, 98.48)		0.51	(197,24)	0.49	(160,24)	0.49	(172,24)	0.47	(220,24)	0.39	(216,24)
38(34.20, 93.97)		0.69	(220,24)	0.63	(135,24)	0.59	(252,24)	0.58	(185,24)	0.50	(160,24)
39(50.00, 86.60)		0.61	(97,24)	0.57	(236,24)	0.55	(151,24)	0.53	(150,24)	0.52	(220,24)
40(64.28, 76.60)		0.70	(144,24)	0.54	(236,24)	0.49	(150,24)	0.46	(225,24)	0.42	(167,24)
41(76.60, 64.28)		0.70	(144,24)	0.67	(213,24)	0.64	(150,24)	0.62	(236,24)	0.54	(196,24)
42(86.60, 50.00)		0.87	(155,24)	0.82	(160,24)	0.65	(180,24)	0.64	(191,24)	0.63	(226,24)
43(93.97, 34.20)		0.83	(235,24)	0.82	(193,24)	0.71	(155,24)	0.70	(160,24)	0.70	(179,24)
44(98.48, 17.36)		1.11	(179,24)	0.77	(193,24)	0.74	(235,24)	0.71	(121,24)	0.61	(109,24)
45(100.00, 0.00)	*	1.58	(179,24) *	1.29	(234,24)	0.60	(132,24)	0.60	(58,24)	0.56	(258,24)
46(98.48, -17.36)		0.84	(234,24)	0.75	(226,24)	0.74	(97,24)	0.68	(101,24)	0.67	(179,24)
47(93.97, -34.20)		0.67	(190,24)	0.67	(97,24)	0.64	(194,24)	0.58	(226,24)	0.57	(115,24)
48(86.60, -50.00)		0.86	(194,24)	0.67	(249,24)	0.63	(54,24)	0.63	(190,24)	0.48	(115,24)
49(76.60, -64.28)		0.81	(194,24)	0.71	(249,24)	0.59	(119,24)	0.59	(242,24)	0.57	(6,24)
50(64.28, -76.60)		0.91	(186,24)	0.78	(42,24)	0.69	(6,24)	0.59	(119,24)	0.58	(249,24)
51(50.00, -86.60)		0.92	(190,24)	0.83	(186,24)	0.55	(79,24)	0.41	(42,24)	0.40	(232,24)
52(34.20, -93.97)		0.54	(190,24)	0.47	(253,24)	0.37	(359,24)	0.35	(79,24)	0.34	(294,24)
53(17.36, -98.48)		0.34	(205,24)	0.24	(186,24)	0.22	(181,24)	0.21	(244,24)	0.21	(95,24)
54(0.00,-100.00)		0.31	(205,24)	0.21	(188,24)	0.20	(181,24)	0.19	(244,24)	0.19	(95,24)
55(-17.36, -98.48)		0.20	(294,24)	0.19	(188,24)	0.19	(304,24)	0.17	(205,24)	0.16	(159,24)
56(-34.20, -93.97)		0.25	(206,24)	0.18	(187,24)	0.15	(294,24)	0.15	(71,24)	0.14	(108,24)
57(-50.00, -86.60)		0.24	(206,24)	0.24	(187,24)	0.16	(204,24)	0.13	(118,24)	0.13	(304,24)
58(-64.28, -76.60)		0.49	(181,24)	0.20	(232,24)	0.20	(187,24)	0.19	(322,24)	0.17	(204,24)
59(-76.60, -64.28)		0.56	(181,24)	0.30	(187,24)	0.28	(257,24)	0.26	(322,24)	0.25	(210,24)
60(-86.60, -50.00)		0.75	(246,24)	0.71	(129,24)	0.54	(238,24)	0.46	(262,24)	0.43	(322,24)
61(-93.97, -34.20)		1.35	(238,24)	0.64	(200,24)	0.59	(201,24)	0.53	(246,24)	0.51	(177,24)
62(-98.48, -17.36)		1.04	(238,24)	0.94	(201,24)	0.76	(200,24)	0.53	(139,24)	0.53	(137,24)
63(-100.00, 0.00)		0.65	(201,24)	0.64	(234,24)	0.40	(210,24)	0.39	(200,24)	0.36	(139,24)
64(-98.48, 17.36)		0.38	(234,24)	0.30	(76,24)	0.25	(210,24)	0.24	(211,24)	0.23	(209,24)
65(-93.97, 34.20)		0.32	(80,24)	0.26	(177,24)	0.24	(76,24)	0.21	(139,24)	0.20	(189,24)
66(-86.60, 50.00)		0.42	(189,24)	0.33	(194,24)	0.28	(80,24)	0.26	(177,24)	0.26	(127,24)
67(-76.60, 64.28)		0.68	(189,24)	0.47	(244,24)	0.36	(127,24)	0.35	(165,24)	0.34	(229,24)
68(-64.28, 76.60)		0.50	(189,24)	0.46	(244,24)	0.30	(188,24)	0.30	(191,24)	0.30	(165,24)
69(-50.00, 86.60)		0.24	(142,24)	0.23	(191,24)	0.23	(95,24)	0.21	(103,24)	0.20	(206,24)
70(-34.20, 93.97)		0.24	(169,24)	0.22	(252,24)	0.17	(104,24)	0.16	(83,24)	0.15	(156,24)
71(-17.36, 98.48)		0.53	(165,24)	0.37	(106,24)	0.37	(297,24)	0.34	(268,24)	0.34	(113,24)
72(0.00, 100.00)		0.61	(106,24)	0.52	(165,24)	0.50	(153,24)	0.50	(197,24)	0.47	(296,24)
73(19.33, 46.66)		0.44	(97,24)	0.30	(252,24)	0.29	(179,24)	0.28	(160,24)	0.24	(277,24)
74(55.93, 55.93)		0.73	(144,24)	0.68	(150,24)	0.50	(236,24)	0.45	(155,24)	0.43	(278,24)

75(58.11,	24.07)	0.87	(70,24)	0.73	(155,24)	0.73	(235,24)	0.69	(179,24)	0.68	(160,24)
76(-108.28,	44.85)	0.34	(80,24)	0.25	(127,24)	0.24	(76,24)	0.24	(177,24)	0.21	(142,24)
77(-33.02,	33.02)	0.28	(189,24)	0.22	(148,24)	0.20	(244,24)	0.19	(144,24)	0.19	(165,24)
78(-15.31,	36.96)	0.24	(156,24)	0.15	(169,24)	0.14	(142,24)	0.14	(95,24)	0.13	(103,24)
79(0.00,	41.00)	0.34	(149,24)	0.29	(213,24)	0.24	(185,24)	0.20	(206,24)	0.19	(199,24)

COMPLEX - 1973

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                    COMPLEX-1 (DATED 86064)
                    AN AIR QUALITY DISPERSION MODEL IN
                    SECTION 4. ADDITIONAL MODELS FOR REGULATORY USE
                    IN UNAMAP (VERSION 6) JULY 86.
                    SOURCE: FILE 31 ON UNAMAP MAGNETIC TAPE FORM NTIS.


                                       COMPLEX I  - VERSION 86064
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

                              GENERAL INPUT INFORMATION

 THIS RUN OF COMPLEX I -VERSION 86064 IS FOR THE POLLUTANT SO2  FOR 8760   1-HOUR PERIODS.
 CONCENTRATION ESTIMATES BEGIN ON HOUR- 1,JULIAN DAY-  1, YEAR-1973.
 A FACTOR OF      0.0010000 HAS BEEN SPECIFIED TO CONVERT USER LENGTH UNITS TO KILOMETERS.
  1 SIGNIFICANT SOURCES ARE TO BE CONSIDERED.
THIS RUN WILL NOT CONSIDER ANY POLLUTANT LOSS.
 HIGH-FIVE SUMMARY CONCENTRATION TABLES WILL BE OUTPUT FOR   4 AVERAGING PERIODS.
 AVG TIMES OF 1,3,8, AND 24 HOURS ARE AUTOMATICALLY DISPLAYED.
  A FACTOR OF      0.3048000 HAS BEEN SPECIFIED TO CONVERT USER HEIGHT UNITS TO METERS.

 OPTION       OPTION LIST                 OPTION SPECIFICATION : 0= IGNORE OPTION
                                                                 1= USE OPTION
                       TECHNICAL OPTIONS
     1        TERRAIN ADJUSTMENTS                                 1
     2        DO NOT INCLUDE STACK DOWNWASH CALCULATIONS          0
     3        DO NOT INCLUDE GRADUAL PLUME RISE CALCULATIONS      1
     4        CALCULATE INITIAL PLUME SIZE                        1
                       INPUT OPTIONS
     5        READ MET DATA FROM CARDS                            0
     6        READ HOURLY EMISSIONS                               0
     7        SPECIFY SIGNIFICANT SOURCES                         0
     8        READ RADIAL DISTANCES TO GENERATE RECEPTORS         1
                       PRINTED OUTPUT OPTIONS
     9        DELETE EMISSIONS WITH HEIGHT TABLE                  1
    10        DELETE MET DATA SUMMARY FOR AVG PERIOD              1
    11        DELETE HOURLY CONTRIBUTIONS                         1
    12        DELETE MET DATA ON HOURLY CONTRIBUTIONS             1
    13        DELETE FINAL PLUME RISE CALC ON HRLY CONTRIBUTIONS  1
    14        DELETE HOURLY SUMMARY                               1
    15        DELETE MET DATA ON HRLY SUMMARY                     1
    16        DELETE FINAL PLUME RISE CALC ON HRLY SUMMARY        1
    17        DELETE AVG-PERIOD CONTRIBUTIONS                     1
    18        DELETE AVERAGING PERIOD SUMMARY                     1
    19        DELETE AVG CONCENTRATIONS AND HI-5 TABLES           0
                       OTHER CONTROL AND OUTPUT OPTIONS
    20        RUN IS PART OF A SEGMENTED RUN                      0
    21        WRITE PARTIAL CONC TO DISK OR TAPE                  0
    22        WRITE HOURLY CONC TO DISK OR TAPE                   0
    23        WRITE AVG-PERIOD CONC TO DISK OR TAPE               0
    24        PUNCH AVG-PERIOD CONC ONTO CARDS                    0
    25        COMPLEX TERRAIN OPTION                              1
    26        CALM PROCESSING OPTION                              0
    27        VALLEY SCREENING OPTION                             0

ANEMOMETER HEIGHT IS:      10.00
EXPONENTS FOR POWER- LAW WIND INCREASE WITH HEIGHT ARE:0.07,0.07,0.10,0.15,0.35,0.55
```

TERRAIN ADJUSTMENTS ARE: 0.500,0.500,0.500,0.500,0.000,0.000 ZMIN IS 10.0

POINT SOURCE INFORMATION

SOURCE	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	SO2(G/SEC) EMISSIONS	PART(G/SEC) EMISSIONS	STACK HT(M)	STACK TEMP(K)	STACK DIAM(M)	STACK VEL(M/SEC)	POTEN. IMPACT (MICRO G/M**3)	EFF HT(M)	GRD-LVL ELEV USER HT UNITS	BUOY FLUX F M**4/S**3
1 FLARE STACK	0.00	0.00	0.01	0.00	10.0	999.0	0.5	0.4	3.08	11.79	108.00	0.16

SIGNIFICANT SO2 POINT SOURCES

RANK	CHI-MAX (MICROGRAMS/M**3)	SOURCE NO.
1	3.08	1

ADDITIONAL INFORMATION ON SOURCES.

EMISSION INFORMATION FOR 1 (NPT) POINT SOURCES HAS BEEN INPUT
1 SIGNIFICANT POINT SOURCES(NSIGP) ARE TO BE USED FOR THIS RUN
THE ORDER OF SIGNIFICANCE(IMPS) FOR 25 OR LESS POINT SOURCES USED IN THIS RUN AS LISTED BY POINT SOURCE NUMBER:
1
SURFACE MET DATA FROM STATION(ISFCD) 14739, YEAR(ISFCYR) 1973
MIXING HEIGHT DATA FROM STATION(IMXD) 14764, YEAR(IMXYR) 1973

RECEPTOR INFORMATION

COMPLEX 1 INTERNALLY GENERATES 36 RECEPTORS ON A CIRCLE CORRESPONDING TO EACH NON-ZERO RADIAL DISTANCE FROM A CENTER POINT
COORDINATES ARE (USER UNITS): (0.000, 0.000)
RADIAL DISTANCE(S) USER SPECIFIED (USER UNITS): 50.000 100.000 0.000 0.000 0.000

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)
1	10,0050	8.682	49.240	0.0	115.0
2	20,0050	17.101	46.985	0.0	119.0
3	30,0050	25.000	43.301	0.0	122.0
4	40,0050	32.139	38.302	0.0	125.0
5	50,0050	38.302	32.139	0.0	127.0
6	60,0050	43.301	25.000	0.0	129.0
7	70,0050	46.985	17.101	0.0	128.0
8	80,0050	49.240	8.682	0.0	126.0
9	90,0050	50.000	0.000	0.0	123.0
10	100,0050	49.240	-8.682	0.0	121.0
11	110,0050	46.985	-17.101	0.0	116.0
12	120,0050	43.301	-25.000	0.0	118.0
13	130,0050	38.302	-32.139	0.0	117.0
14	140,0050	32.139	-38.302	0.0	113.0
15	150,0050	25.000	-43.301	0.0	106.0
16	160,0050	17.101	-46.985	0.0	108.0
17	170,0050	8.682	-49.240	0.0	102.0
18	180,0050	0.000	-50.000	0.0	99.0
19	190,0050	-8.682	-49.240	0.0	102.0
20	200,0050	-17.101	-46.985	0.0	108.0
21	210,0050	-25.000	-43.301	0.0	110.0
22	220,0050	-32.139	-38.302	0.0	112.0
23	230,0050	-38.302	-32.139	0.0	113.0
24	240,0050	-43.301	-25.000	0.0	115.0
25	250,0050	-46.985	-17.101	0.0	115.0

26	260,0050	-49.240	-8.682	0.0	113.0
27	270,0050	-50.000	0.000	0.0	110.0
28	280,0050	-49.240	8.682	0.0	105.0
29	290,0050	-46.985	17.101	0.0	103.0
30	300,0050	-43.301	25.000	0.0	97.0
31	310,0050	-38.302	32.139	0.0	92.0
32	320,0050	-32.139	38.302	0.0	96.0
33	330,0050	-25.000	43.301	0.0	103.0
34	340,0050	-17.101	46.985	0.0	108.0
35	350,0050	-8.682	49.240	0.0	111.0
36	360,0050	0.000	50.000	0.0	113.0
37	10,0100	17.365	98.481	0.0	108.0
38	20,0100	34.202	93.969	0.0	113.0
39	30,0100	50.000	86.603	0.0	120.0
40	40,0100	64.279	76.604	0.0	124.0
41	50,0100	76.604	64.279	0.0	128.0
42	60,0100	86.603	50.000	0.0	128.0
43	70,0100	93.969	34.202	0.0	128.0
44	80,0100	98.481	17.365	0.0	127.0
45	90,0100	100.000	0.000	0.0	130.0
46	100,0100	98.481	-17.365	0.0	125.0
47	110,0100	93.969	-34.202	0.0	120.0
48	120,0100	86.603	-50.000	0.0	117.0
49	130,0100	76.604	-64.279	0.0	113.0
50	140,0100	64.279	-76.604	0.0	111.0
51	150,0100	50.000	-86.603	0.0	111.0
52	160,0100	34.202	-93.969	0.0	107.0
53	170,0100	17.365	-98.481	0.0	88.0
54	180,0100	0.000	-100.000	0.0	84.0
55	190,0100	-17.365	-98.481	0.0	82.0
56	200,0100	-34.202	-93.969	0.0	82.0
57	210,0100	-50.000	-86.603	0.0	82.0
58	220,0100	-64.279	-76.604	0.0	84.0
59	230,0100	-76.604	-64.279	0.0	96.0
60	240,0100	-86.602	-50.000	0.0	108.0
61	250,0100	-93.969	-34.202	0.0	111.0
62	260,0100	-98.481	-17.365	0.0	106.0
63	270,0100	-100.000	0.000	0.0	98.0
64	280,0100	-98.481	17.365	0.0	88.0
65	290,0100	-93.969	34.202	0.0	76.0
66	300,0100	-86.603	50.000	0.0	76.0
67	310,0100	-76.605	64.279	0.0	80.0
68	320,0100	-64.279	76.604	0.0	85.0
69	330,0100	-50.000	86.602	0.0	87.0
70	340,0100	-34.202	93.969	0.0	97.0
71	350,0100	-17.365	98.481	0.0	106.0
72	360,0100	0.000	100.000	0.0	110.0
73	FENC22.5	19.330	46.660	0.0	120.0
74	FENC45.0	55.930	55.930	0.0	126.0
75	FENC67.5	58.110	24.070	0.0	130.0
76	FEN292.5	-108.280	44.850	0.0	74.0
77	FEN315.0	-33.020	33.020	0.0	94.0
78	FEN337.5	-15.310	36.960	0.0	112.0
79	FEN360.0	0.000	41.000	0.0	116.0

COMPLEX I - VERSION 86064

COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

RECEPTORS

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)	DAY	AVG CONC FOR PERIOD 1.HR 1. TO DAY365.HR24. (MICROGRAMS/M**3)
1	10,0050	8.68	49.24	0.0	115.0		0.03
2	20,0050	17.10	46.98	0.0	119.0		0.02
3	30,0050	25.00	43.30	0.0	122.0		0.01
4	40,0050	32.14	38.30	0.0	125.0		0.01
5	50,0050	38.30	32.14	0.0	127.0		0.03
6	60,0050	43.30	25.00	0.0	129.0		0.04
7	70,0050	46.98	17.10	0.0	128.0		0.04
8	80,0050	49.24	8.68	0.0	126.0		0.04
9	90,0050	50.00	0.00	0.0	123.0		0.04
10	100,0050	49.24	-8.68	0.0	121.0		0.04
11	110,0050	46.98	-17.10	0.0	116.0		0.03
12	120,0050	43.30	-25.00	0.0	118.0		0.03
13	130,0050	38.30	-32.14	0.0	117.0		0.03
14	140,0050	32.14	-38.30	0.0	113.0		0.02
15	150,0050	25.00	-43.30	0.0	106.0		0.01
16	160,0050	17.10	-46.98	0.0	108.0		0.01
17	170,0050	8.68	-49.24	0.0	102.0		0.01
18	180,0050	0.00	-50.00	0.0	99.0		0.01
19	190,0050	-8.68	-49.24	0.0	102.0		0.01
20	200,0050	-17.10	-46.98	0.0	108.0		0.01
21	210,0050	-25.00	-43.30	0.0	110.0		0.01
22	220,0050	-32.14	-38.30	0.0	112.0		0.01
23	230,0050	-38.30	-32.14	0.0	113.0		0.01
24	240,0050	-43.30	-25.00	0.0	115.0		0.01
25	250,0050	-46.98	-17.10	0.0	115.0		0.02
26	260,0050	-49.24	-8.68	0.0	113.0		0.03
27	270,0050	-50.00	0.00	0.0	110.0		0.04
28	280,0050	-49.24	8.68	0.0	105.0		0.02
29	290,0050	-46.98	17.10	0.0	103.0		0.02
30	300,0050	-43.30	25.00	0.0	97.0		0.01
31	310,0050	-38.30	32.14	0.0	92.0		0.01
32	320,0050	-32.14	38.30	0.0	96.0		0.02
33	330,0050	-25.00	43.30	0.0	103.0		0.02
34	340,0050	-17.10	46.98	0.0	108.0		0.02
35	350,0050	-8.68	49.24	0.0	111.0		0.02
36	360,0050	0.00	50.00	0.0	113.0		0.02
37	10,0100	17.36	98.48	0.0	108.0		0.07
38	20,0100	34.20	93.97	0.0	113.0		0.06
39	30,0100	50.00	86.60	0.0	120.0		0.05
40	40,0100	64.28	76.60	0.0	124.0		0.05
41	50,0100	76.60	64.28	0.0	128.0		0.08
42	60,0100	86.60	50.00	0.0	128.0		0.10
43	70,0100	93.97	34.20	0.0	128.0		0.11
44	80,0100	98.48	17.36	0.0	127.0		0.10
45	90,0100	100.00	0.00	0.0	130.0		0.10
46	100,0100	98.48	-17.36	0.0	125.0		* 0.11
47	110,0100	93.97	-34.20	0.0	120.0		0.10
48	120,0100	86.60	-50.00	0.0	117.0		0.10
49	130,0100	76.60	-64.28	0.0	113.0		0.10
50	140,0100	64.28	-76.60	0.0	111.0		0.08
51	150,0100	50.00	-86.60	0.0	111.0		0.06
52	160,0100	34.20	-93.97	0.0	107.0		0.04
53	170,0100	17.36	-98.48	0.0	88.0		0.02
54	180,0100	0.00	-100.00	0.0	84.0		0.02

55	190,0100	-17.36	-98.48	0.0	82.0	0.02
56	200,0100	-34.20	-93.97	0.0	82.0	0.01
57	210,0100	-50.00	-86.60	0.0	82.0	0.01
58	220,0100	-64.28	-76.60	0.0	84.0	0.01
59	230,0100	-76.60	-64.28	0.0	96.0	0.03
60	240,0100	-86.60	-50.00	0.0	108.0	0.05
61	250,0100	-93.97	-34.20	0.0	111.0	0.06
62	260,0100	-98.48	-17.36	0.0	106.0	0.07
63	270,0100	-100.00	0.00	0.0	98.0	0.06
64	280,0100	-98.48	17.36	0.0	88.0	0.03
65	290,0100	-93.97	34.20	0.0	76.0	0.02
66	300,0100	-86.60	50.00	0.0	76.0	0.02
67	310,0100	-76.60	64.28	0.0	80.0	0.03
68	320,0100	-64.28	76.60	0.0	85.0	0.03
69	330,0100	-50.00	86.60	0.0	87.0	0.03
70	340,0100	-34.20	93.97	0.0	97.0	0.03
71	350,0100	-17.36	98.48	0.0	106.0	0.05
72	360,0100	0.00	100.00	0.0	110.0	0.07
73	FENC22.5	19.33	46.66	0.0	120.0	0.02
74	FENC45.0	55.93	55.93	0.0	126.0	0.05
75	FENC67.5	58.11	24.07	0.0	130.0	0.06
76	FEN292.5	-108.28	44.85	0.0	74.0	0.02
77	FEN315.0	-33.02	33.02	0.0	94.0	0.01
78	FEN337.5	-15.31	36.96	0.0	112.0	0.01
79	FEN360.0	0.00	41.00	0.0	116.0	0.02

FIVE HIGHEST 1-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR		1	2	3	4	5
1(8.68, 49.24)		11.08 (188,10)	10.98 (230,10)	10.95 (230, 9)	10.85 (140, 9)	8.45 (143,12)
2(17.10, 46.98)		12.79 (188,10)	12.65 (230, 9)	8.45 (188,11)	7.84 (172, 8)	7.83 (195, 6)
3(25.00, 43.30)		14.17 (188,10)	9.09 (195, 6)	8.97 (265, 8)	7.61 (174,12)	7.24 (60, 8)
4(32.14, 38.30)		9.74 (128, 9)	8.74 (230, 8)	7.21 (192,11)	7.21 (192,12)	7.21 (220, 9)
5(38.30, 32.14)		16.68 (206,11)	9.74 (128, 9)	9.74 (159, 6)	9.74 (215, 8)	9.74 (224, 9)
6(43.30, 25.00)	*	17.76 (206,11) *	14.17 (222,12)	11.01 (159, 8)	10.78 (140, 6)	9.74 (128, 9)
7(46.98, 17.10)		14.17 (222,12)	10.46 (159, 8)	10.38 (114,12)	9.74 (174, 6)	9.74 (206, 8)
8(49.24, 8.68)		14.17 (222,12)	9.75 (105,10)	9.74 (174, 6)	9.42 (159, 8)	9.35 (114,12)
9(50.00, 0.00)		14.03 (174,10)	9.44 (105,10)	9.43 (84, 9)	9.41 (84, 8)	7.94 (229, 7)
10(49.24, -8.68)		13.81 (190,11)	13.30 (219,11)	13.24 (174,10)	8.68 (206, 7)	8.62 (235, 9)
11(46.98, -17.10)		11.59 (190,11)	11.42 (219,11)	10.27 (222,11)	8.45 (205,11)	6.78 (188, 9)
12(43.30, -25.00)		10.61 (205,12)	10.60 (222,11)	8.45 (205,11)	7.46 (219, 7)	7.45 (206, 7)
13(38.30, -32.14)		10.54 (205,12)	7.12 (188, 9)	6.97 (120,10)	6.83 (353,14)	5.71 (83,11)
14(32.14, -38.30)		10.18 (229, 9)	5.71 (200, 8)	5.69 (166,17)	5.62 (120,10)	5.57 (238,13)
15(25.00, -43.30)		7.74 (229, 9)	3.86 (205, 8)	3.86 (150, 9)	3.86 (277,10)	3.80 (200, 8)
16(17.10, -46.98)		4.38 (99,10)	4.30 (205, 8)	4.29 (277,10)	4.27 (211, 7)	4.27 (166,17)
17(8.68, -49.24)		3.14 (197, 8)	3.10 (99,10)	3.06 (99,13)	2.97 (211, 8)	2.96 (236,10)
18(0.00, -50.00)		5.54 (59,11)	2.61 (197, 9)	2.61 (197, 8)	2.59 (109, 9)	2.45 (211, 8)
19(-8.68, -49.24)		6.31 (59,11)	3.18 (243,10)	3.14 (197, 8)	3.14 (197, 9)	3.08 (109, 9)
20(-17.10, -46.98)		8.09 (59,11)	4.49 (243,10)	4.41 (282,10)	4.29 (211, 9)	4.28 (203, 8)
21(-25.00, -43.30)		4.92 (282,10)	4.82 (211, 9)	4.77 (203, 9)	4.05 (264, 9)	3.15 (198,11)
22(-32.14, -38.30)		5.40 (211, 9)	5.28 (203, 9)	4.08 (198, 7)	3.15 (198,11)	3.15 (198,12)
23(-38.30, -32.14)		5.81 (191, 8)	5.55 (191, 9)	5.54 (232, 9)	4.34 (198, 7)	4.33 (237, 8)
24(-43.30, -25.00)		9.92 (199,11)	6.44 (191, 8)	6.42 (171, 8)	6.35 (99,12)	6.31 (231, 7)
25(-46.98, -17.10)		10.92 (157,12)	9.92 (199,11)	8.45 (211,11)	6.45 (230,15)	6.44 (191, 8)
26(-49.24, -8.68)		10.26 (230,12)	10.19 (230,13)	10.14 (157,12)	9.34 (199,11)	8.30 (211,11)
27(-50.00, 0.00)		9.15 (230,12)	9.10 (230,11)	9.08 (230,13)	8.50 (197,13)	7.60 (211,11)
28(-49.24, 8.68)		7.50 (230,12)	7.44 (230,11)	7.21 (197,13)	3.76 (239,10)	3.75 (237,14)
[illegible] -46.98, 17.10)		6.73 (197,13)	6.72 (197,12)	6.[illegible] (206,13)	3.35 (239,10)	3.33 (235,11)

30(-43.30, 25.00)	5.43 (218,12)	5.41 (197,12)	5.39 (154,11)	5.20 (83,13)	4.94 (206,13)
31(-38.30, 32.14)	4.68 (150,10)	4.66 (140,13)	4.47 (218,12)	4.47 (218,11)	4.46 (229,12)
32(-32.14, 38.30)	5.56 (190,13)	5.52 (150,10)	5.49 (140,13)	5.23 (218,11)	5.21 (229,12)
33(-25.00, 43.30)	7.30 (190,13)	7.25 (150,10)	7.24 (175,10)	7.21 (140,13)	6.98 (190,12)
34(-17.10, 46.98)	8.67 (175,10)	8.35 (237,10)	7.98 (159,10)	7.16 (205,13)	4.48 (244,12)
35(-8.68, 49.24)	9.32 (140, 9)	7.85 (184,13)	7.84 (205,13)	7.83 (183,10)	5.24 (173,10)
36(0.00, 50.00)	10.19 (230,10)	10.07 (140, 9)	8.33 (184,13)	8.31 (183,10)	8.29 (143,12)
37(17.36, 98.48)	8.58 (230,10)	8.58 (230, 9)	8.55 (140, 9)	8.49 (188,10)	7.73 (219,15)
38(34.20, 93.97)	9.05 (230, 9)	8.96 (188,10)	8.44 (174,12)	8.41 (192,10)	8.29 (60, 8)
39(50.00, 86.60)	9.61 (188,10)	9.52 (174,12)	9.36 (60, 8)	7.60 (195, 6)	7.57 (265, 8)
40(64.28, 76.60)	10.20 (230, 8)	7.97 (128, 9)	7.77 (196,16)	7.72 (140, 5)	7.24 (128, 6)
41(76.60, 64.28)	10.85 (230, 8)	10.70 (140, 6)	10.49 (206,11)	8.94 (190,14)	8.80 (230, 6)
42(86.60, 50.00)	10.78 (159, 8)	10.70 (140, 6)	10.49 (206,11)	8.94 (190,14)	8.83 (224, 5)
43(93.97, 34.20)	10.78 (159, 8)	10.75 (114,12)	8.84 (224, 6)	8.83 (224, 5)	8.80 (230, 6)
44(98.48, 17.36)	10.62 (159, 8)	10.59 (114,12)	10.55 (269, 8)	8.58 (224, 6)	8.51 (156, 5)
45(100.00, 0.00)	11.18 (229, 8)	11.06 (229, 7)	11.04 (269, 8)	9.43 (159,16)	9.27 (269, 7)
46(98.48, -17.36)	10.36 (229, 8)	10.34 (109, 7)	10.26 (229, 7)	10.22 (84,10)	10.09 (190,11)
47(93.97, -34.20)	9.63 (190,11)	9.56 (229, 8)	9.54 (109, 7)	9.43 (84,10)	7.61 (219, 7)
48(86.60, -50.00)	8.92 (21,14)	7.29 (219, 7)	7.29 (206, 7)	7.21 (353,14)	6.03 (353,16)
49(76.60, -64.28)	8.45 (197, 7)	8.31 (21,14)	6.83 (120,10)	6.78 (353,14)	5.65 (188, 9)
50(64.28, -76.60)	8.87 (229, 9)	8.15 (197, 7)	6.65 (200, 8)	6.64 (166,17)	6.62 (120,10)
51(50.00, -86.60)	8.87 (229, 9)	8.08 (269, 9)	6.65 (200, 8)	6.64 (211, 7)	6.64 (166,17)
52(34.20, -93.97)	7.54 (236,11)	7.50 (269, 9)	6.22 (211, 7)	6.22 (166,17)	6.20 (282, 9)
53(17.36, -98.48)	5.06 (236,11)	5.05 (237, 7)	5.04 (203, 7)	4.36 (211, 8)	4.36 (236,10)
54(0.00,-100.00)	6.27 (59,11)	4.60 (166,16)	4.59 (237, 7)	4.59 (203, 7)	4.53 (27,10)
55(-17.36, -98.48)	6.09 (59,11)	4.38 (166,16)	4.38 (237, 7)	4.36 (154, 7)	4.36 (154, 6)
56(-34.20, -93.97)	6.09 (59,11)	4.36 (154, 7)	4.36 (154, 6)	3.84 (211, 9)	3.84 (203, 8)
57(-50.00, -86.60)	3.84 (211, 9)	3.26 (282,10)	2.81 (203, 9)	2.17 (264, 9)	1.77 (198,12)
58(-64.28, -76.60)	4.60 (198, 7)	4.01 (211, 9)	2.93 (203, 9)	1.84 (204,11)	1.84 (198,12)
59(-76.60, -64.28)	6.04 (198, 7)	6.04 (237, 8)	4.29 (191, 8)	3.65 (191, 9)	3.65 (232, 9)
60(-86.60, -50.00)	7.71 (237, 8)	6.31 (231, 7)	5.24 (191, 8)	5.23 (171, 8)	5.22 (99,12)
61(-93.97, -34.20)	8.73 (157,12)	6.65 (230,14)	6.65 (191, 7)	6.63 (231, 7)	5.48 (230,15)
62(-98.48, -17.36)	8.39 (230,13)	8.30 (230,12)	8.27 (157,12)	6.12 (230,14)	6.12 (191, 7)
63(-100.00, 0.00)	7.64 (230,11)	7.64 (230,13)	7.56 (230,12)	6.33 (246,12)	6.25 (123, 8)
64(-98.48, 17.36)	6.72 (230,11)	6.65 (230,12)	5.09 (246,12)	5.01 (123, 8)	4.37 (206,15)
65(-93.97, 34.20)	3.75 (123, 8)	3.74 (147, 8)	3.59 (197,13)	3.59 (197,12)	3.32 (330,11)
66(-86.60, 50.00)	5.63 (83,13)	3.78 (182,13)	3.78 (229,13)	3.78 (214, 8)	3.74 (147, 8)
67(-76.60, 64.28)	5.98 (140,10)	5.97 (83,13)	5.95 (104,10)	4.66 (150,10)	4.65 (140,13)
68(-64.28, 76.60)	6.42 (140,10)	6.41 (190,12)	6.38 (104,10)	4.98 (190,13)	4.96 (150,10)
69(-50.00, 86.60)	6.61 (237,10)	6.60 (140,10)	6.59 (190,12)	5.10 (190,13)	5.09 (150,10)
70(-34.20, 93.97)	7.53 (237,10)	6.17 (216,10)	6.13 (154, 9)	6.12 (154, 8)	6.11 (137, 8)
71(-17.36, 98.48)	8.36 (140, 9)	7.40 (159, 9)	7.38 (114, 8)	7.34 (137, 8)	6.12 (218, 9)
72(0.00, 100.00)	8.77 (230,10)	8.74 (140, 9)	8.02 (219,15)	7.98 (159, 9)	7.97 (114, 8)
73(19.33, 46.66)	13.32 (188,10)	13.19 (230, 9)	8.43 (188,11)	8.33 (195, 6)	8.22 (265, 8)
74(55.93, 55.93)	12.04 (230, 8)	11.92 (140, 6)	9.86 (128, 9)	9.86 (159, 6)	9.86 (222,13)
75(58.11, 24.07)	17.19 (206,11)	13.62 (159, 8)	13.56 (114,12)	12.59 (222,12)	10.73 (174, 6)
76(-108.28, 44.85)	5.20 (83,13)	4.01 (182,13)	4.01 (214, 8)	3.98 (147, 8)	3.09 (197,12)
77(-33.02, 33.02)	4.46 (150,10)	4.43 (140,13)	4.37 (218,12)	4.36 (218,11)	4.35 (229,12)
78(-15.31, 36.96)	8.02 (190,13)	7.93 (175,10)	7.92 (159,10)	7.45 (205,13)	6.39 (237,10)
79(0.00, 41.00)	8.48 (230,10)	8.34 (140, 9)	8.10 (143,12)	8.10 (183,10)	8.10 (184,13)

FIVE HIGHEST 3-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	6.51 (188,12)	5.95 (173,12)	5.74 (140, 9)	3.70 (114, 9)	3.66 (230,12)
2(17.10, 46.98)	7.08 (188,12)	4.79 (230, 9)	3.21 (184,12)	3.04 (265, 9)	2.61 (172, 9)
3(25.00, 43.30)	4.72 (188,12)	3.03 (195, 6)	2.99 (265, 9)	2.54 (174,12)	2.41 (60, 9)
4(32.14, 38.30)	5.55 (128, 9)	4.81 (192,12)	3.15 (220, 9)	2.91 (230, 9)	2.41 (221,12)

5(38.30, 32.14)	5.56 (206,12)	4.81 (192,12)	3.65 (128, 9)	3.26 (159, 6)	3.25 (215, 9)
6(43.30, 25.00)	5.92 (206,12)	4.72 (222,12)	4.28 (209, 9)	3.67 (159, 9)	3.65 (224, 9)
7(46.98, 17.10)	7.12 (222,12)	3.65 (224, 9)	3.49 (159, 9)	3.46 (114,12)	3.25 (174, 6)
8(49.24, 8.68)	7.12 (222,12)	4.81 (253,15)	3.83 (269, 9)	3.26 (174, 6)	3.25 (105,12)
9(50.00, 0.00)	7.08 (174,12)	6.30 (84, 9)	5.26 (229, 9)	3.17 (269, 9)	3.15 (105,12)
10(49.24, -8.68)	6.96 (219,12) *	6.81 (174,12)	5.69 (84, 9)	4.70 (229, 9)	4.60 (190,12)
11(46.98, -17.10)	5.16 (219,12)	3.86 (190,12)	3.61 (188, 9)	3.42 (222,12)	2.82 (205,12)
12(43.30, -25.00)	6.35 (205,12)	4.31 (83,12)	4.15 (188, 9)	3.53 (222,12)	3.25 (253,12)
13(38.30, -32.14)	4.12 (188, 9)	3.51 (205,12)	3.49 (83,12)	2.75 (353,15)	2.32 (120,12)
14(32.14, -38.30)	3.39 (229, 9)	1.90 (200, 9)	1.90 (166,18)	1.87 (120,12)	1.86 (238,15)
15(25.00, -43.30)	2.58 (229, 9)	2.42 (277,12)	1.71 (225,15)	1.29 (205, 9)	1.29 (150, 9)
16(17.10, -46.98)	1.75 (282, 9)	1.61 (225,15)	1.60 (271,12)	1.46 (99,12)	1.43 (205, 9)
17(8.68, -49.24)	1.71 (236,12)	1.10 (260, 9)	1.05 (197, 9)	1.03 (99,12)	1.02 (99,15)
18(0.00, -50.00)	2.39 (59,12)	1.74 (197, 9)	1.39 (203, 9)	0.93 (226, 9)	0.91 (260, 9)
19(-8.68, -49.24)	2.78 (59,12)	2.09 (197, 9)	1.16 (226, 9)	1.06 (243,12)	1.03 (109, 9)
20(-17.10, -46.98)	2.70 (59,12)	1.50 (243,12)	1.47 (282,12)	1.43 (211, 9)	1.43 (203, 9)
21(-25.00, -43.30)	2.35 (198,12)	1.64 (282,12)	1.61 (211, 9)	1.59 (203, 9)	1.35 (264, 9)
22(-32.14, -38.30)	2.35 (198,12)	1.80 (211, 9)	1.76 (203, 9)	1.36 (198, 9)	1.30 (204,12)
23(-38.30, -32.14)	3.79 (191, 9)	1.85 (232, 9)	1.72 (198, 9)	1.44 (237, 9)	1.35 (292,12)
24(-43.30, -25.00)	4.05 (191, 9)	3.31 (199,12)	2.68 (231, 9)	2.14 (171, 9)	2.12 (99,12)
25(-46.98, -17.10)	4.27 (230,15)	4.27 (191, 9)	4.17 (211,12)	3.64 (157,12)	3.31 (199,12)
26(-49.24, -8.68)	7.24 (230,15)	6.06 (211,12)	4.70 (197,12)	4.29 (199,12)	4.28 (211,15)
27(-50.00, 0.00)	6.29 (230,15)	6.08 (230,12)	5.54 (211,12)	4.60 (203,12)	4.32 (281,12)
28(-49.24, 8.68)	4.98 (230,12)	2.59 (239,12)	2.40 (197,15)	2.31 (203,12)	1.50 (237,15)
29(-46.98, 17.10)	3.12 (206,15)	2.24 (197,15)	2.24 (197,12)	2.09 (239,12)	1.29 (137,12)
30(-43.30, 25.00)	3.43 (154,12)	2.42 (206,15)	2.26 (159,12)	1.81 (218,12)	1.80 (197,12)
31(-38.30, 32.14)	3.30 (154,12)	2.98 (218,12)	2.10 (150,12)	2.03 (229,12)	1.55 (140,15)
32(-32.14, 38.30)	3.89 (154,12)	2.53 (150,12)	2.46 (218,12)	2.21 (229,12)	1.85 (190,15)
33(-25.00, 43.30)	3.07 (205,15)	2.43 (190,15)	2.42 (150,12)	2.41 (175,12)	2.40 (140,15)
34(-17.10, 46.98)	2.89 (175,12)	2.78 (237,12)	2.66 (159,12)	2.53 (243,12)	2.52 (137, 9)
35(-8.68, 49.24)	3.42 (173,12)	3.35 (192,15)	3.11 (140, 9)	2.89 (184,15)	2.70 (243,12)
36(0.00, 50.00)	5.65 (173,12)	5.28 (140, 9)	4.35 (183,12)	3.40 (230,12)	3.32 (184,15)
37(17.36, 98.48)	4.69 (173,12)	4.66 (114, 9)	4.59 (140, 9)	4.23 (188,12)	3.60 (184, 6)
38(34.20, 93.97)	4.44 (188,12)	4.43 (230, 9)	3.47 (265, 9)	3.29 (60, 9)	3.18 (184,12)
39(50.00, 86.60)	3.20 (188,12)	3.17 (174,12)	3.12 (60, 9)	2.62 (128, 9)	2.53 (195, 6)
40(64.28, 76.60)	5.28 (128, 9)	3.99 (192,12)	3.92 (220, 9)	3.40 (230, 9)	2.59 (196,18)
41(76.60, 64.28)	4.12 (139,18)	3.99 (192,12)	3.92 (220, 9)	3.68 (128, 9)	3.68 (230, 6)
42(86.60, 50.00)	4.39 (209, 9)	4.16 (224, 9)	3.87 (27, 9)	3.59 (159, 9)	3.57 (140, 6)
43(93.97, 34.20)	5.90 (224, 6)	4.43 (222,12)	4.16 (224, 9)	3.85 (27, 9)	3.59 (159, 9)
44(98.48, 17.36)	6.34 (269, 9)	4.43 (222,12)	3.99 (253,15)	3.54 (159, 9)	3.53 (114,12)
45(100.00, 0.00) *	7.41 (229, 9)	6.77 (269, 9)	6.05 (84, 9)	4.43 (174,12)	3.44 (189, 9)
46(98.48, -17.36)	6.88 (229, 9)	5.31 (84, 9)	4.89 (109, 9)	4.58 (247, 9)	4.57 (219,12)
47(93.97, -34.20)	4.62 (109, 9)	4.58 (247, 9)	3.72 (197, 6)	3.51 (219,12)	3.44 (219, 9)
48(86.60, -50.00)	4.15 (188, 9)	3.57 (83,12)	3.47 (165, 9)	3.29 (205,12)	2.97 (21,15)
49(76.60, -64.28)	4.05 (188, 9)	3.46 (353,15)	2.91 (83,12)	2.90 (225, 9)	2.82 (197, 9)
50(64.28, -76.60)	3.01 (236, 9)	2.96 (229, 9)	2.85 (336,12)	2.72 (197, 9)	2.38 (323,12)
51(50.00, -86.60)	2.96 (229, 9)	2.93 (225,15)	2.69 (269, 9)	2.67 (277,12)	2.66 (323,12)
52(34.20, -93.97)	3.48 (282, 9)	2.51 (236,12)	2.50 (269, 9)	2.07 (211, 9)	2.07 (166,18)
53(17.36, -98.48)	3.14 (236,12)	1.68 (237, 9)	1.68 (203, 9)	1.45 (353,12)	1.45 (211, 9)
54(0.00,-100.00)	3.59 (59,12)	2.87 (203, 9)	2.27 (197, 9)	1.87 (226, 9)	1.58 (166,18)
55(-17.36, -98.48)	3.46 (59,12)	2.18 (197, 9)	1.77 (226, 9)	1.46 (166,18)	1.46 (237, 9)
56(-34.20, -93.97)	2.03 (59,12)	1.45 (154, 9)	1.45 (154, 6)	1.28 (211, 9)	1.28 (203, 9)
57(-50.00, -86.60)	1.49 (198,12)	1.28 (211, 9)	1.09 (282,12)	1.07 (32,12)	0.98 (328,12)
58(-64.28, -76.60)	1.55 (198,12)	1.53 (198, 9)	1.34 (211, 9)	1.07 (198,18)	1.06 (328,12)
59(-76.60, -64.28)	2.65 (191, 9)	2.54 (198, 9)	2.01 (237, 9)	1.74 (198,18)	1.66 (328,12)
60(-86.60, -50.00)	3.33 (231, 9)	3.22 (191, 9)	2.57 (237, 9)	2.08 (257,12)	1.99 (68,12)
61(-93.97, -34.20)	4.04 (230,15)	4.04 (191, 9)	4.02 (231, 9)	2.91 (157,12)	2.57 (211,12)
62(-98.48, -17.36)	6.53 (230,15)	4.31 (191,15)	4.15 (211,12)	3.41 (211,15)	3.28 (203,12)
63(-100.00, 0.00)	5.80 (230,15)	5.07 (230,12)	3.96 (203,12)	3.72 (211,12)	3.67 (191,15)
64(-98.48, 17.36)	4.46 (230,12)	2.52 (239,12)	1.8[illegible] (182,18)	1.84 (203,12)	1.71 (237,15)

65(-93.97, 34.20)	1.83 (206,15)	1.61 (123, 9)	1.61 (239,12)	1.25 (147, 9)	1.20 (197,15)
66(-86.60, 50.00)	2.29 (182,15)	2.22 (229,15)	2.20 (154,12)	1.88 (83,15)	1.83 (206,15)
67(-76.60, 64.28)	2.88 (154,12)	2.52 (218,12)	2.44 (229,15)	2.34 (150,12)	2.18 (182,15)
68(-64.28, 76.60)	3.07 (154,12)	2.91 (229,12)	2.53 (174,15)	2.52 (150,12)	2.49 (104,12)
69(-50.00, 86.60)	3.27 (154, 9)	3.07 (216,12)	2.83 (137, 9)	2.63 (174,15)	2.22 (140,12)
70(-34.20, 93.97)	4.08 (154, 9)	3.79 (216,12)	3.49 (137, 9)	2.74 (275, 9)	2.51 (237,12)
71(-17.36, 98.48)	3.18 (275, 9)	3.12 (173,12)	3.10 (140, 9)	2.86 (192,15)	2.76 (137, 9)
72(0.00, 100.00)	5.31 (159, 9)	5.14 (140, 9)	4.83 (173,12)	4.83 (114, 9)	3.79 (184, 6)
73(19.33, 46.66)	7.25 (188,12)	4.99 (230, 9)	3.23 (265, 9)	2.78 (195, 6)	2.43 (183, 9)
74(55.93, 55.93)	6.34 (140, 6)	6.25 (128, 9)	4.93 (192,12)	4.33 (220, 9)	4.01 (230, 9)
75(58.11, 24.07)	6.87 (222,12)	5.73 (206,12)	5.14 (209, 9)	4.54 (159, 9)	4.52 (114,12)
76(-108.28, 44.85)	2.36 (182,15)	1.86 (147, 9)	1.73 (83,15)	1.63 (206,15)	1.52 (239,12)
77(-33.02, 33.02)	3.42 (218,12)	3.22 (154,12)	1.98 (150,12)	1.95 (229,12)	1.48 (140,15)
78(-15.31, 36.96)	2.67 (190,15)	2.64 (175,12)	2.64 (159,12)	2.48 (205,15)	2.13 (237,12)
79(0.00, 41.00)	4.36 (140, 9)	4.36 (173,12)	3.84 (183,12)	2.90 (184,15)	2.83 (230,12)

FIVE HIGHEST 8-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	2.77 (184,16)	2.74 (230,16)	2.44 (188,16)	2.41 (173,16)	1.59 (140,16)
2(17.10, 46.98)	2.65 (188,16)	1.71 (184,16)	1.58 (230,16)	0.98 (172, 8)	0.98 (195, 8)
3(25.00, 43.30)	1.77 (188,16)	1.14 (195, 8)	1.12 (265, 8)	0.95 (174,16)	0.90 (60, 8)
4(32.14, 38.30)	1.80 (192,16)	1.26 (128, 8)	1.22 (128,16)	1.10 (230, 8)	0.90 (221,16)
5(38.30, 32.14)	2.09 (206,16)	1.80 (192,16)	1.62 (220,16)	1.53 (230, 8)	1.30 (188,16)
6(43.30, 25.00)	3.14 (222,16)	2.59 (159, 8)	2.40 (206,16)	2.12 (128,16)	1.77 (220,16)
7(46.98, 17.10)	2.82 (222,16)	1.92 (224,16)	1.53 (189,16)	1.31 (159, 8)	1.30 (114,16)
8(49.24, 8.68)	3.26 (222,16)	1.94 (189,16)	1.93 (105,16)	1.80 (253,16)	1.44 (269, 8)
9(50.00, 0.00)	2.65 (174,16)	2.35 (229, 8)	1.41 (238,16)	1.39 (189, 8)	1.22 (163,16)
10(49.24, -8.68)	3.12 (219,16)	2.56 (174,16)	2.08 (229, 8)	1.94 (84,16)	1.73 (190,16)
11(46.98, -17.10)	1.93 (219,16)	1.48 (84,16)	1.45 (190,16)	1.31 (246,16)	1.28 (222,16)
12(43.30, -25.00)	2.38 (205,16)	1.62 (83,16)	1.33 (222,16)	1.22 (253,16)	1.21 (280,16)
13(38.30, -32.14)	2.03 (205,16)	1.93 (238,16)	1.48 (83,16)	1.23 (280,16)	1.18 (165,16)
14(32.14, -38.30)	1.39 (238,16)	1.27 (229,16)	0.80 (217,16)	0.78 (264,16)	0.77 (83,16)
15(25.00, -43.30)	1.10 (277,16)	0.97 (229,16)	0.74 (225,16)	0.58 (217,16)	0.54 (264,16)
16(17.10, -46.98)	1.21 (99,16)	0.77 (277,16)	0.60 (225,16)	0.60 (271,16)	0.57 (211, 8)
17(8.68, -49.24)	0.77 (99,16)	0.64 (236,16)	0.39 (197, 8)	0.37 (211, 8)	0.37 (282,16)
18(0.00, -50.00)	0.95 (59,16)	0.52 (203, 8)	0.35 (226, 8)	0.33 (197,16)	0.33 (197, 8)
19(-8.68, -49.24)	1.04 (59,16)	0.52 (154, 8)	0.43 (226, 8)	0.40 (243,16)	0.39 (197, 8)
20(-17.10, -46.98)	1.01 (59,16)	0.78 (154, 8)	0.56 (243,16)	0.55 (282,16)	0.54 (211,16)
21(-25.00, -43.30)	0.98 (198,16)	0.62 (282,16)	0.60 (211,16)	0.60 (203,16)	0.51 (264,16)
22(-32.14, -38.30)	1.26 (198,16)	0.67 (211,16)	0.66 (203,16)	0.51 (198, 8)	0.49 (204,16)
23(-38.30, -32.14)	0.97 (198,16)	0.90 (191,16)	0.84 (232,16)	0.73 (191, 8)	0.54 (198, 8)
24(-43.30, -25.00)	1.24 (199,16)	1.03 (191, 8)	1.00 (231, 8)	0.93 (176,16)	0.93 (191,16)
25(-46.98, -17.10)	2.07 (211,16)	1.82 (191, 8)	1.75 (199,16)	1.60 (230,16)	1.37 (157,16)
26(-49.24, -8.68)	4.00 (230,16) *	3.88 (211,16)	2.64 (191,16)	2.28 (157,16)	2.12 (199,16)
27(-50.00, 0.00) *	4.64 (230,16)	3.78 (211,16)	2.63 (197,16)	2.48 (191,16)	1.72 (203,16)
28(-49.24, 8.68)	1.96 (230,16)	1.06 (239,16)	1.03 (237,16)	0.90 (197,16)	0.87 (203,16)
29(-46.98, 17.10)	1.76 (197,16)	1.17 (206,16)	0.91 (203,16)	0.84 (147,16)	0.78 (239,16)
30(-43.30, 25.00)	1.33 (154,16)	1.02 (197,16)	0.91 (206,16)	0.89 (159,16)	0.80 (218,16)
31(-38.30, 32.14)	1.24 (154,16)	1.14 (218,16)	1.10 (140,16)	1.10 (229,16)	0.79 (150,16)
32(-32.14, 38.30)	1.46 (154,16)	1.34 (190,16)	1.31 (140,16)	1.10 (229,16)	0.95 (150,16)
33(-25.00, 43.30)	1.79 (190,16)	1.75 (140,16)	1.15 (205,16)	0.91 (150,16)	0.90 (175,16)
34(-17.10, 46.98)	1.09 (59,16)	1.08 (175,16)	1.04 (237,16)	1.00 (159,16)	0.95 (243,16)
35(-8.68, 49.24)	1.91 (173,16)	1.49 (183,16)	1.26 (192,16)	1.17 (140,16)	1.08 (184,16)
36(0.00, 50.00)	2.85 (184,16)	2.29 (173,16)	2.14 (183,16)	1.39 (140,16)	1.27 (230,16)
37(17.36, 98.48)	2.20 (184,16)	2.17 (173,16)	2.14 (230,16)	1.81 (184, 8)	1.75 (114, 8)
38(34.20, 93.97)	1.67 (188,16)	1.62 (184,16)	1.23 (60, 8)	1.13 (230,16)	1.12 (183, 8)
39(50.00, 86.60)	1.20 (188,16)	1.19 (174,16)	1.17 (60, 8)	0.98 (128, 8)	0.95 (195, 8)

40(64.28, 76.60)	1.89 (128, 8)	1.55 (230, 8)	1.50 (192,16)	1.19 (170, 8)	1.10 (128,16)
41(76.60, 64.28)	2.74 (230, 8)	2.06 (215, 8)	1.58 (220,16)	1.55 (139,24)	1.50 (192,16)
42(86.60, 50.00)	2.35 (159, 8)	2.29 (222,16)	2.08 (220,16)	1.94 (215, 8)	1.76 (206,16)
43(93.97, 34.20)	2.78 (224, 8)	2.32 (224,16)	2.05 (222,16)	1.80 (200, 8)	1.69 (169,16)
44(98.48, 17.36)	2.38 (269, 8)	2.16 (222,16)	1.88 (189,16)	1.74 (169,16)	1.59 (105,16)
45(100.00, 0.00)	3.86 (229, 8)	2.54 (269, 8)	1.98 (189, 8)	1.66 (174,16)	1.57 (163,16)
46(98.48, -17.36)	3.48 (229, 8)	2.27 (84,16)	2.14 (219,16)	1.83 (109, 8)	1.67 (315,16)
47(93.97, -34.20)	2.13 (84,16)	1.73 (109, 8)	1.40 (197, 8)	1.32 (219,16)	1.29 (219, 8)
48(86.60, -50.00)	1.93 (206, 8)	1.66 (353,16)	1.54 (165,16)	1.34 (83,16)	1.24 (125,16)
49(76.60, -64.28)	2.26 (165,16)	1.61 (238,16)	1.59 (197, 8)	1.54 (83,16)	1.33 (153,16)
50(64.28, -76.60)	1.82 (225,16)	1.38 (217,16)	1.19 (323,16)	1.18 (336,16)	1.17 (264,16)
51(50.00, -86.60)	2.02 (277,16)	1.68 (323,16)	1.46 (211, 8)	1.40 (225,16)	1.17 (264,16)
52(34.20, -93.97)	1.51 (99,16)	1.44 (277,16)	1.39 (236,16)	1.32 (211, 8)	0.94 (269,16)
53(17.36, -98.48)	1.18 (236,16)	0.87 (237, 8)	0.85 (99,16)	0.66 (203, 8)	0.55 (353,16)
54(0.00,-100.00)	1.50 (59,16)	1.09 (203, 8)	0.70 (226, 8)	0.57 (166,16)	0.57 (237, 8)
55(-17.36, -98.48)	1.30 (59,16)	1.09 (154, 8)	0.68 (226, 8)	0.55 (166,16)	0.55 (237, 8)
56(-34.20, -93.97)	1.09 (154, 8)	0.80 (32,16)	0.76 (59,16)	0.51 (198, 8)	0.48 (211,16)
57(-50.00, -86.60)	0.68 (198,16)	0.48 (211,16)	0.41 (282,16)	0.40 (32,16)	0.38 (199,16)
58(-64.28, -76.60)	1.03 (198,16)	0.58 (198, 8)	0.50 (211,16)	0.40 (167,16)	0.40 (328,16)
59(-76.60, -64.28)	1.35 (198,16)	0.77 (191,16)	0.76 (198, 8)	0.76 (237, 8)	0.71 (232,16)
60(-86.60, -50.00)	1.25 (231, 8)	1.21 (226,16)	1.17 (191, 8)	1.05 (297,16)	1.01 (191,16)
61(-93.97, -34.20)	2.08 (191, 8)	1.52 (230,16)	1.39 (211,16)	1.37 (257,16)	1.33 (231, 8)
62(-98.48, -17.36)	3.49 (230,16)	2.83 (211,16)	2.78 (191,16)	1.96 (157,16)	1.63 (122,16)
63(-100.00, 0.00)	4.07 (230,16)	2.78 (211,16)	2.37 (191,16)	1.81 (231,16)	1.61 (197,16)
64(-98.48, 17.36)	1.85 (230,16)	1.10 (237,16)	1.10 (239,16)	0.78 (231,16)	0.75 (109,16)
65(-93.97, 34.20)	1.03 (197,16)	0.75 (203,16)	0.69 (206,16)	0.66 (147,16)	0.60 (123, 8)
66(-86.60, 50.00)	1.11 (229,16)	1.02 (233,16)	0.94 (197,16)	0.94 (154,16)	0.88 (182,16)
67(-76.60, 64.28)	1.68 (229,16)	1.33 (140,16)	1.14 (233,16)	1.10 (154,16)	1.08 (218,16)
68(-64.28, 76.60)	1.53 (229,16)	1.45 (140,16)	1.42 (190,16)	1.23 (59,16)	1.21 (84,16)
69(-50.00, 86.60)	1.49 (140,16)	1.46 (190,16)	1.15 (216,16)	1.14 (59,16)	0.99 (174,16)
70(-34.20, 93.97)	1.42 (216,16)	1.08 (59,16)	1.03 (275, 8)	1.02 (347,16)	1.00 (196,16)
71(-17.36, 98.48)	1.71 (173,16)	1.27 (137, 8)	1.07 (192,16)	1.05 (185,16)	1.04 (140,16)
72(0.00, 100.00)	2.50 (184,16)	2.25 (173,16)	1.81 (114, 8)	1.56 (192,16)	1.45 (183,16)
73(19.33, 46.66)	2.72 (188,16)	1.65 (230,16)	1.04 (195, 8)	1.03 (265, 8)	0.92 (183, 8)
74(55.93, 55.93)	2.38 (140, 8)	2.00 (128, 8)	1.85 (192,16)	1.65 (230, 8)	1.34 (159, 8)
75(58.11, 24.07)	2.86 (222,16)	2.48 (206,16)	2.36 (224,16)	1.87 (224, 8)	1.86 (189,16)
76(-108.28, 44.85)	0.90 (182,16)	0.70 (147, 8)	0.65 (83,16)	0.65 (147,16)	0.63 (203,16)
77(-33.02, 33.02)	1.28 (218,16)	1.21 (154,16)	1.02 (140,16)	1.02 (229,16)	0.74 (150,16)
78(-15.31, 36.96)	1.00 (190,16)	0.99 (175,16)	0.99 (159,16)	0.93 (205,16)	0.81 (59,16)
79(0.00, 41.00)	2.24 (184,16)	1.80 (183,16)	1.70 (173,16)	1.09 (140,16)	1.06 (230,16)

FIVE HIGHEST 24-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	1.29 (184,24)	0.91 (230,24)	0.87 (173,24)	0.84 (183,24)	0.81 (188,24)
2(17.10, 46.98)	0.88 (188,24)	0.64 (184,24)	0.60 (230,24)	0.50 (172,24)	0.45 (183,24)
3(25.00, 43.30)	0.59 (188,24)	0.38 (195,24)	0.37 (265,24)	0.34 (60,24)	0.32 (174,24)
4(32.14, 38.30)	0.83 (128,24)	0.60 (192,24)	0.41 (230,24)	0.40 (220,24)	0.30 (221,24)
5(38.30, 32.14)	0.70 (206,24)	0.64 (220,24)	0.61 (192,24)	0.59 (128,24)	0.51 (230,24)
6(43.30, 25.00)	1.21 (206,24)	1.05 (222,24)	0.87 (159,24)	0.71 (128,24)	0.71 (209,24)
7(46.98, 17.10)	0.99 (224,24)	0.98 (222,24)	0.65 (174,24)	0.58 (189,24)	0.50 (200,24)
8(49.24, 8.68)	1.13 (222,24)	0.72 (189,24)	0.65 (105,24)	0.65 (174,24)	0.60 (253,24)
9(50.00, 0.00)	0.89 (174,24)	0.81 (189,24)	0.79 (84,24)	0.78 (229,24)	0.67 (163,24)
10(49.24, -8.68)	1.08 (219,24)	1.00 (84,24)	0.96 (174,24)	0.87 (190,24)	0.69 (229,24)
11(46.98, -17.10)	0.97 (219,24)	0.54 (190,24)	0.52 (247,24)	0.49 (84,24)	0.45 (188,24)
12(43.30, -25.00)	0.85 (205,24)	0.56 (206,24)	0.54 (83,24)	0.53 (165,24)	0.52 (188,24)
13(38.30, -32.14)	0.73 (205,24)	0.64 (238,24)	0.52 (187,24)	0.52 (188,24)	0.50 (83,24)
[illegible] 32.14, -38.30)	0.65 (166,24)	0.46 (238,24)	0.[illegible] (229,24)	0.39 (187,24)	0.36 (225,24)

15(	25.00, -43.30)	0.37	(277,24)	0.37	(166,24)	0.32	(229,24)	0.25	(225,24)	0.19	(217,24)
16(	17.10, -46.98)	0.40	(99,24)	0.26	(277,24)	0.22	(282,24)	0.20	(225,24)	0.20	(271,24)
17(	8.68, -49.24)	0.26	(99,24)	0.23	(236,24)	0.14	(260,24)	0.13	(197,24)	0.12	(211,24)
18(	0.00, -50.00)	0.32	(59,24)	0.22	(197,24)	0.17	(203,24)	0.12	(226,24)	0.11	(260,24)
19(	-8.68, -49.24)	0.35	(59,24)	0.26	(197,24)	0.17	(154,24)	0.14	(226,24)	0.14	(236,24)
20(	-17.10, -46.98)	0.34	(59,24)	0.26	(154,24)	0.19	(243,24)	0.18	(282,24)	0.18	(211,24)
21(	-25.00, -43.30)	0.33	(198,24)	0.21	(282,24)	0.20	(211,24)	0.20	(203,24)	0.17	(264,24)
22(	-32.14, -38.30)	0.65	(198,24)	0.22	(211,24)	0.22	(203,24)	0.16	(204,24)	0.11	(167,24)
23(	-38.30, -32.14)	0.57	(198,24)	0.54	(191,24)	0.28	(232,24)	0.18	(237,24)	0.17	(292,24)
24(	-43.30, -25.00)	0.65	(191,24)	0.41	(199,24)	0.34	(231,24)	0.31	(176,24)	0.27	(171,24)
25(	-46.98, -17.10)	0.81	(211,24)	0.67	(191,24)	0.58	(199,24)	0.53	(230,24)	0.46	(157,24)
26(	-49.24, -8.68)	1.40	(211,24) *	1.33	(230,24)	1.23	(191,24)	0.76	(157,24)	0.71	(199,24)
27(	-50.00, 0.00)	1.55	(230,24)	1.31	(211,24)	0.91	(191,24)	0.88	(197,24)	0.57	(203,24)
28(	-49.24, 8.68)	0.65	(230,24)	0.35	(239,24)	0.34	(237,24)	0.30	(197,24)	0.29	(203,24)
29(	-46.98, 17.10)	0.61	(197,24)	0.39	(206,24)	0.38	(147,24)	0.32	(203,24)	0.26	(239,24)
30(	-43.30, 25.00)	0.44	(154,24)	0.36	(218,24)	0.35	(197,24)	0.30	(206,24)	0.30	(159,24)
31(	-38.30, 32.14)	0.45	(218,24)	0.41	(154,24)	0.38	(229,24)	0.37	(140,24)	0.26	(150,24)
32(	-32.14, 38.30)	0.51	(190,24)	0.49	(154,24)	0.44	(140,24)	0.37	(229,24)	0.32	(150,24)
33(	-25.00, 43.30)	0.69	(190,24)	0.58	(140,24)	0.38	(205,24)	0.30	(150,24)	0.30	(175,24)
34(	-17.10, 46.98)	0.36	(59,24)	0.36	(175,24)	0.35	(237,24)	0.33	(159,24)	0.32	(243,24)
35(	-8.68, 49.24)	0.64	(173,24)	0.50	(183,24)	0.44	(192,24)	0.39	(140,24)	0.38	(184,24)
36(	0.00, 50.00)	1.21	(184,24)	0.77	(183,24)	0.77	(173,24)	0.70	(140,24)	0.44	(192,24)
37(	17.36, 98.48)	1.45	(184,24)	1.10	(173,24)	0.92	(183,24)	0.78	(140,24)	0.76	(172,24)
38(	34.20, 93.97)	0.82	(60,24)	0.80	(184,24)	0.75	(173,24)	0.68	(185,24)	0.65	(183,24)
39(	50.00, 86.60)	0.69	(207,24)	0.66	(60,24)	0.56	(174,24)	0.55	(222,24)	0.43	(173,24)
40(	64.28, 76.60)	1.06	(128,24)	0.74	(230,24)	0.65	(192,24)	0.59	(220,24)	0.52	(207,24)
41(	76.60, 64.28)	0.99	(230,24)	0.96	(128,24)	0.95	(220,24)	0.74	(192,24)	0.69	(215,24)
42(	86.60, 50.00)	1.05	(206,24)	1.04	(220,24)	1.03	(224,24)	0.96	(159,24)	0.88	(222,24)
43(	93.97, 34.20) *	1.88	(224,24)	0.97	(200,24)	0.87	(189,24)	0.84	(222,24)	0.83	(169,24)
44(	98.48, 17.36)	1.05	(224,24)	0.95	(169,24)	0.93	(200,24)	0.91	(189,24)	0.88	(222,24)
45(	100.00, 0.00)	1.29	(229,24)	1.07	(189,24)	0.95	(163,24)	0.85	(269,24)	0.76	(84,24)
46(	98.48, -17.36)	1.16	(229,24)	1.09	(84,24)	0.93	(174,24)	0.83	(219,24)	0.77	(190,24)
47(	93.97, -34.20)	0.87	(219,24)	0.73	(165,24)	0.71	(247,24)	0.71	(84,24)	0.58	(109,24)
48(	86.60, -50.00)	1.03	(165,24)	0.79	(206,24)	0.67	(125,24)	0.62	(143,24)	0.62	(205,24)
49(	76.60, -64.28)	0.98	(165,24)	0.89	(225,24)	0.79	(125,24)	0.69	(217,24)	0.63	(255,24)
50(	64.28, -76.60)	0.92	(225,24)	0.86	(166,24)	0.61	(193,24)	0.52	(336,24)	0.52	(217,24)
51(	50.00, -86.60)	0.67	(277,24)	0.64	(166,24)	0.61	(323,24)	0.49	(211,24)	0.48	(126,24)
52(	34.20, -93.97)	0.53	(99,24)	0.48	(277,24)	0.46	(236,24)	0.44	(211,24)	0.44	(282,24)
53(	17.36, -98.48)	0.48	(236,24)	0.29	(99,24)	0.29	(237,24)	0.22	(203,24)	0.19	(282,24)
54(	0.00, -100.00)	0.52	(59,24)	0.36	(203,24)	0.28	(197,24)	0.24	(236,24)	0.23	(226,24)
55(	-17.36, -98.48)	0.44	(59,24)	0.36	(154,24)	0.27	(197,24)	0.23	(236,24)	0.23	(226,24)
56(	-34.20, -93.97)	0.36	(154,24)	0.29	(32,24)	0.25	(59,24)	0.17	(198,24)	0.16	(211,24)
57(	-50.00, -86.60)	0.23	(198,24)	0.16	(211,24)	0.15	(32,24)	0.14	(282,24)	0.13	(199,24)
58(	-64.28, -76.60)	0.61	(198,24)	0.17	(211,24)	0.14	(167,24)	0.13	(328,24)	0.13	(147,24)
59(	-76.60, -64.28)	0.82	(198,24)	0.44	(191,24)	0.28	(156,24)	0.27	(65,24)	0.25	(237,24)
60(	-86.60, -50.00)	0.73	(65,24)	0.73	(191,24)	0.51	(145,24)	0.49	(297,24)	0.48	(267,24)
61(	-93.97, -34.20)	0.90	(191,24)	0.82	(211,24)	0.70	(231,24)	0.60	(65,24)	0.57	(157,24)
62(	-98.48, -17.36)	1.52	(191,24)	1.29	(211,24)	1.16	(230,24)	0.72	(231,24)	0.69	(157,24)
63(	-100.00, 0.00)	1.36	(230,24)	1.05	(211,24)	1.02	(191,24)	0.60	(231,24)	0.54	(197,24)
64(	-98.48, 17.36)	0.62	(230,24)	0.37	(237,24)	0.37	(239,24)	0.34	(109,24)	0.30	(182,24)
65(	-93.97, 34.20)	0.40	(197,24)	0.38	(147,24)	0.30	(203,24)	0.23	(206,24)	0.20	(123,24)
66(	-86.60, 50.00)	0.46	(147,24)	0.41	(229,24)	0.38	(218,24)	0.37	(197,24)	0.34	(233,24)
67(	-76.60, 64.28)	0.68	(229,24)	0.49	(218,24)	0.44	(140,24)	0.44	(233,24)	0.37	(154,24)
68(	-64.28, 76.60)	0.67	(190,24)	0.59	(229,24)	0.48	(140,24)	0.41	(59,24)	0.40	(84,24)
69(	-50.00, 86.60)	0.69	(190,24)	0.50	(140,24)	0.49	(154,24)	0.38	(216,24)	0.38	(59,24)
70(	-34.20, 93.97)	0.51	(154,24)	0.47	(216,24)	0.47	(137,24)	0.38	(59,24)	0.36	(347,24)
71(	-17.36, 98.48)	0.57	(173,24)	0.53	(192,24)	0.47	(185,24)	0.45	(137,24)	0.44	(275,24)
72(	0.00, 100.00)	1.42	(184,24)	0.80	(173,24)	0.75	(140,24)	0.72	(192,24)	0.69	(185,24)
73(	19.33, 46.66)	0.91	(188,24)	0.62	(230,24)	0.46	(183,24)	0.41	(60,24)	0.40	(265,24)
74(	55.93, 55.93)	1.18	(128,24)	0.79	(140,24)	0.71	(230,24)	0.66	(192,24)	0.59	(220,24)

75(58.11, 24.07)	1.54	(224,24)	1.29	(206,24)	1.05	(222,24)	0.85	(209,24)	0.74	(200,24)
76(-108.28, 44.85)	0.46	(147,24)	0.35	(203,24)	0.30	(182,24)	0.25	(197,24)	0.24	(233,24)
77(-33.02, 33.02)	0.49	(218,24)	0.40	(154,24)	0.34	(229,24)	0.34	(140,24)	0.25	(150,24)
78(-15.31, 36.96)	0.33	(190,24)	0.33	(175,24)	0.33	(159,24)	0.31	(205,24)	0.27	(59,24)
79(0.00, 41.00)	0.93	(184,24)	0.62	(183,24)	0.57	(173,24)	0.56	(140,24)	0.35	(230,24)

COMPLEX - 1974

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                 COMPLEX-1 (DATED 86064)
                 AN AIR QUALITY DISPERSION MODEL IN
                 SECTION 4. ADDITIONAL MODELS FOR REGULATORY USE
                 IN UNAMAP (VERSION 6) JULY 86.
                 SOURCE: FILE 31 ON UNAMAP MAGNETIC TAPE FORM NTIS.


                                    COMPLEX I  - VERSION 86064
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

                           GENERAL INPUT INFORMATION

 THIS RUN OF COMPLEX I -VERSION 86064 IS FOR THE POLLUTANT SO2  FOR 8760   1-HOUR PERIODS.
 CONCENTRATION ESTIMATES BEGIN ON HOUR- 1,JULIAN DAY-  1, YEAR-1974.
 A FACTOR OF      0.0010000 HAS BEEN SPECIFIED TO CONVERT USER LENGTH UNITS TO KILOMETERS.
  1 SIGNIFICANT SOURCES ARE TO BE CONSIDERED.
THIS RUN WILL NOT CONSIDER ANY POLLUTANT LOSS.
 HIGH-FIVE SUMMARY CONCENTRATION TABLES WILL BE OUTPUT FOR   4 AVERAGING PERIODS.
 AVG TIMES OF 1,3,8, AND 24 HOURS ARE AUTOMATICALLY DISPLAYED.
  A FACTOR OF      0.3048000 HAS BEEN SPECIFIED TO CONVERT USER HEIGHT UNITS TO METERS.

 OPTION      OPTION LIST                OPTION SPECIFICATION : 0= IGNORE OPTION
                                                               1= USE OPTION
                     TECHNICAL OPTIONS
     1       TERRAIN ADJUSTMENTS                                 1
     2       DO NOT INCLUDE STACK DOWNWASH CALCULATIONS          0
     3       DO NOT INCLUDE GRADUAL PLUME RISE CALCULATIONS      1
     4       CALCULATE INITIAL PLUME SIZE                        1
                     INPUT OPTIONS
     5       READ MET DATA FROM CARDS                            0
     6       READ HOURLY EMISSIONS                               0
     7       SPECIFY SIGNIFICANT SOURCES                         0
     8       READ RADIAL DISTANCES TO GENERATE RECEPTORS         1
                     PRINTED OUTPUT OPTIONS
     9       DELETE EMISSIONS WITH HEIGHT TABLE                  1
    10       DELETE MET DATA SUMMARY FOR AVG PERIOD              1
    11       DELETE HOURLY CONTRIBUTIONS                         1
    12       DELETE MET DATA ON HOURLY CONTRIBUTIONS             1
    13       DELETE FINAL PLUME RISE CALC ON HRLY CONTRIBUTIONS  1
    14       DELETE HOURLY SUMMARY                               1
    15       DELETE MET DATA ON HRLY SUMMARY                     1
    16       DELETE FINAL PLUME RISE CALC ON HRLY SUMMARY        1
    17       DELETE AVG-PERIOD CONTRIBUTIONS                     1
    18       DELETE AVERAGING PERIOD SUMMARY                     1
    19       DELETE AVG CONCENTRATIONS AND HI-5 TABLES           0
                     OTHER CONTROL AND OUTPUT OPTIONS
    20       RUN IS PART OF A SEGMENTED RUN                      0
    21       WRITE PARTIAL CONC TO DISK OR TAPE                  0
    22       WRITE HOURLY CONC TO DISK OR TAPE                   0
    23       WRITE AVG-PERIOD CONC TO DISK OR TAPE               0
    24       PUNCH AVG-PERIOD CONC ONTO CARDS                    0
    25       COMPLEX TERRAIN OPTION                              1
    26       CALM PROCESSING OPTION                              0
    27       VALLEY SCREENING OPTION                             0

ANEMOMETER HEIGHT IS:     10.00
EXPONENTS FOR POWER- LAW WIND INCREASE WITH HEIGHT ARE:0.07,0.07,0.10,0.15,0.35,0.55
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TERRAIN ADJUSTMENTS ARE: 0.500,0.500,0.500,0.500,0.000,0.000 ZMIN IS 10.0

POINT SOURCE INFORMATION

SOURCE	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	SO2(G/SEC) EMISSIONS	PART(G/SEC) EMISSIONS	STACK HT(M)	STACK TEMP(K)	STACK DIAM(M)	STACK VEL(M/SEC)	POTEN. IMPACT (MICRO G/M**3)	EFF HT(M)	GRD-LVL ELEV USER HT UNITS	BUOY FLUX F M**4/S**3
1 FLARE STACK	0.00	0.00	0.01	0.00	10.0	999.0	0.5	0.4	3.08	11.79	108.00	0.16

SIGNIFICANT SO2 POINT SOURCES

RANK	CHI-MAX (MICROGRAMS/M**3)	SOURCE NO.
1	3.08	1

ADDITIONAL INFORMATION ON SOURCES.

EMISSION INFORMATION FOR 1 (NPT) POINT SOURCES HAS BEEN INPUT
1 SIGNIFICANT POINT SOURCES(NSIGP) ARE TO BE USED FOR THIS RUN
THE ORDER OF SIGNIFICANCE(IMPS) FOR 25 OR LESS POINT SOURCES USED IN THIS RUN AS LISTED BY POINT SOURCE NUMBER:
1
SURFACE MET DATA FROM STATION(ISFCD) 14739, YEAR(ISFCYR) 1974
MIXING HEIGHT DATA FROM STATION(IMXD) 14764, YEAR(IMXYR) 1974

RECEPTOR INFORMATION

COMPLEX I INTERNALLY GENERATES 36 RECEPTORS ON A CIRCLE CORRESPONDING TO EACH NON-ZERO RADIAL DISTANCE FROM A CENTER POINT
COORDINATES ARE (USER UNITS): (0.000, 0.000)
RADIAL DISTANCE(S) USER SPECIFIED (USER UNITS): 50.000 100.000 0.000 0.000 0.000

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)
1	10,0050	8.682	49.240	0.0	115.0
2	20,0050	17.101	46.985	0.0	119.0
3	30,0050	25.000	43.301	0.0	122.0
4	40,0050	32.139	38.302	0.0	125.0
5	50,0050	38.302	32.139	0.0	127.0
6	60,0050	43.301	25.000	0.0	129.0
7	70,0050	46.985	17.101	0.0	128.0
8	80,0050	49.240	8.682	0.0	126.0
9	90,0050	50.000	0.000	0.0	123.0
10	100,0050	49.240	-8.682	0.0	121.0
11	110,0050	46.985	-17.101	0.0	116.0
12	120,0050	43.301	-25.000	0.0	118.0
13	130,0050	38.302	-32.139	0.0	117.0
14	140,0050	32.139	-38.302	0.0	113.0
15	150,0050	25.000	-43.301	0.0	106.0
16	160,0050	17.101	-46.985	0.0	108.0
17	170,0050	8.682	-49.240	0.0	102.0
18	180,0050	0.000	-50.000	0.0	99.0
19	190,0050	-8.682	-49.240	0.0	102.0
20	200,0050	-17.101	-46.985	0.0	108.0
21	210,0050	-25.000	-43.301	0.0	110.0
22	220,0050	-32.139	-38.302	0.0	112.0
23	230,0050	-38.302	-32.139	0.0	113.0
24	240,0050	-43.301	-25.000	0.0	115.0
25	250,0050	-46.985	-17.101	0.0	115.0

26	260,0050	-49.240	-8.682	0.0	113.0
27	270,0050	-50.000	0.000	0.0	110.0
28	280,0050	-49.240	8.682	0.0	105.0
29	290,0050	-46.985	17.101	0.0	103.0
30	300,0050	-43.301	25.000	0.0	97.0
31	310,0050	-38.302	32.139	0.0	92.0
32	320,0050	-32.139	38.302	0.0	96.0
33	330,0050	-25.000	43.301	0.0	103.0
34	340,0050	-17.101	46.985	0.0	108.0
35	350,0050	-8.682	49.240	0.0	111.0
36	360,0050	0.000	50.000	0.0	113.0
37	10,0100	17.365	98.481	0.0	108.0
38	20,0100	34.202	93.969	0.0	113.0
39	30,0100	50.000	86.603	0.0	120.0
40	40,0100	64.279	76.604	0.0	124.0
41	50,0100	76.604	64.279	0.0	128.0
42	60,0100	86.603	50.000	0.0	128.0
43	70,0100	93.969	34.202	0.0	128.0
44	80,0100	98.481	17.365	0.0	127.0
45	90,0100	100.000	0.000	0.0	130.0
46	100,0100	98.481	-17.365	0.0	125.0
47	110,0100	93.969	-34.202	0.0	120.0
48	120,0100	86.603	-50.000	0.0	117.0
49	130,0100	76.604	-64.279	0.0	113.0
50	140,0100	64.279	-76.604	0.0	111.0
51	150,0100	50.000	-86.603	0.0	111.0
52	160,0100	34.202	-93.969	0.0	107.0
53	170,0100	17.365	-98.481	0.0	88.0
54	180,0100	0.000	-100.000	0.0	84.0
55	190,0100	-17.365	-98.481	0.0	82.0
56	200,0100	-34.202	-93.969	0.0	82.0
57	210,0100	-50.000	-86.603	0.0	82.0
58	220,0100	-64.279	-76.604	0.0	84.0
59	230,0100	-76.604	-64.279	0.0	96.0
60	240,0100	-86.602	-50.000	0.0	108.0
61	250,0100	-93.969	-34.202	0.0	111.0
62	260,0100	-98.481	-17.365	0.0	106.0
63	270,0100	-100.000	0.000	0.0	98.0
64	280,0100	-98.481	17.365	0.0	88.0
65	290,0100	-93.969	34.202	0.0	76.0
66	300,0100	-86.603	50.000	0.0	76.0
67	310,0100	-76.605	64.279	0.0	80.0
68	320,0100	-64.279	76.604	0.0	85.0
69	330,0100	-50.000	86.602	0.0	87.0
70	340,0100	-34.202	93.969	0.0	97.0
71	350,0100	-17.365	98.481	0.0	106.0
72	360,0100	0.000	100.000	0.0	110.0
73	FENC22.5	19.330	46.660	0.0	120.0
74	FENC45.0	55.930	55.930	0.0	126.0
75	FENC67.5	58.110	24.070	0.0	130.0
76	FEN292.5	-108.280	44.850	0.0	74.0
77	FEN315.0	-33.020	33.020	0.0	94.0
78	FEN337.5	-15.310	36.960	0.0	112.0
79	FEN360.0	0.000	41.000	0.0	116.0

COMPLEX I - VERSION 86064
COMPLEX MODELING OF PROPOSED ENCLOSED FLARE
WOBURN, MS; INDRUSTRI-PLEX SITE
CASE 1

RECEPTORS

RECEPTOR	IDENTIFICATION	EAST COORD (USER UNITS)	NORTH COORD (USER UNITS)	RECEPTOR HT ABV LOCAL GRD LVL (METERS)	RECEPTOR GROUND LEVEL ELEVATION (USER HT UNITS)	DAY	AVG CONC FOR PERIOD 1.HR 1. TO DAY365.HR24. (MICROGRAMS/M**3)
1	10,0050	8.68	49.24	0.0	115.0		0.01
2	20,0050	17.10	46.98	0.0	119.0		0.01
3	30,0050	25.00	43.30	0.0	122.0		0.01
4	40,0050	32.14	38.30	0.0	125.0		0.01
5	50,0050	38.30	32.14	0.0	127.0		0.02
6	60,0050	43.30	25.00	0.0	129.0		0.02
7	70,0050	46.98	17.10	0.0	128.0		0.02
8	80,0050	49.24	8.68	0.0	126.0		0.02
9	90,0050	50.00	0.00	0.0	123.0		0.02
10	100,0050	49.24	-8.68	0.0	121.0		0.02
11	110,0050	46.98	-17.10	0.0	116.0		0.02
12	120,0050	43.30	-25.00	0.0	118.0		0.02
13	130,0050	38.30	-32.14	0.0	117.0		0.02
14	140,0050	32.14	-38.30	0.0	113.0		0.02
15	150,0050	25.00	-43.30	0.0	106.0		0.01
16	160,0050	17.10	-46.98	0.0	108.0		0.01
17	170,0050	8.68	-49.24	0.0	102.0		0.01
18	180,0050	0.00	-50.00	0.0	99.0		0.00
19	190,0050	-8.68	-49.24	0.0	102.0		0.00
20	200,0050	-17.10	-46.98	0.0	108.0		0.00
21	210,0050	-25.00	-43.30	0.0	110.0		0.00
22	220,0050	-32.14	-38.30	0.0	112.0		0.00
23	230,0050	-38.30	-32.14	0.0	113.0		0.01
24	240,0050	-43.30	-25.00	0.0	115.0		0.01
25	250,0050	-46.98	-17.10	0.0	115.0		0.01
26	260,0050	-49.24	-8.68	0.0	113.0		0.02
27	270,0050	-50.00	0.00	0.0	110.0		0.01
28	280,0050	-49.24	8.68	0.0	105.0		0.01
29	290,0050	-46.98	17.10	0.0	103.0		0.01
30	300,0050	-43.30	25.00	0.0	97.0		0.01
31	310,0050	-38.30	32.14	0.0	92.0		0.01
32	320,0050	-32.14	38.30	0.0	96.0		0.01
33	330,0050	-25.00	43.30	0.0	103.0		0.01
34	340,0050	-17.10	46.98	0.0	108.0		0.01
35	350,0050	-8.68	49.24	0.0	111.0		0.01
36	360,0050	0.00	50.00	0.0	113.0		0.01
37	10,0100	17.36	98.48	0.0	108.0		0.05
38	20,0100	34.20	93.97	0.0	113.0		0.05
39	30,0100	50.00	86.60	0.0	120.0		0.04
40	40,0100	64.28	76.60	0.0	124.0		0.05
41	50,0100	76.60	64.28	0.0	128.0		0.08
42	60,0100	86.60	50.00	0.0	128.0		* 0.10
43	70,0100	93.97	34.20	0.0	128.0		0.09
44	80,0100	98.48	17.36	0.0	127.0		0.07
45	90,0100	100.00	0.00	0.0	130.0		0.08
46	100,0100	98.48	-17.36	0.0	125.0		0.09
47	110,0100	93.97	-34.20	0.0	120.0		0.09
48	120,0100	86.60	-50.00	0.0	117.0		0.09
49	130,0100	76.60	-64.28	0.0	113.0		0.08
50	140,0100	64.28	-76.60	0.0	111.0		0.07
51	150,0100	50.00	-86.60	0.0	111.0		0.07
52	160,0100	34.20	-93.97	0.0	107.0		0.06
53	170,0100	17.36	-98.48	0.0	88.0		0.02
54	180,0100	0.00	-100.00	0.0	84.0		0.02

55	190,0100	-17.36	-98.48	0.0	82.0	0.01
56	200,0100	-34.20	-93.97	0.0	82.0	0.01
57	210,0100	-50.00	-86.60	0.0	82.0	0.01
58	220,0100	-64.28	-76.60	0.0	84.0	0.01
59	230,0100	-76.60	-64.28	0.0	96.0	0.02
60	240,0100	-86.60	-50.00	0.0	108.0	0.04
61	250,0100	-93.97	-34.20	0.0	111.0	0.05
62	260,0100	-98.48	-17.36	0.0	106.0	0.05
63	270,0100	-100.00	0.00	0.0	98.0	0.03
64	280,0100	-98.48	17.36	0.0	88.0	0.02
65	290,0100	-93.97	34.20	0.0	76.0	0.01
66	300,0100	-86.60	50.00	0.0	76.0	0.02
67	310,0100	-76.60	64.28	0.0	80.0	0.02
68	320,0100	-64.28	76.60	0.0	85.0	0.02
69	330,0100	-50.00	86.60	0.0	87.0	0.02
70	340,0100	-34.20	93.97	0.0	97.0	0.02
71	350,0100	-17.36	98.48	0.0	106.0	0.03
72	360,0100	0.00	100.00	0.0	110.0	0.04
73	FENC22.5	19.33	46.66	0.0	120.0	0.01
74	FENC45.0	55.93	55.93	0.0	126.0	0.04
75	FENC67.5	58.11	24.07	0.0	130.0	0.04
76	FEN292.5	-108.28	44.85	0.0	74.0	0.02
77	FEN315.0	-33.02	33.02	0.0	94.0	0.01
78	FEN337.5	-15.31	36.96	0.0	112.0	0.00
79	FEN360.0	0.00	41.00	0.0	116.0	0.00

FIVE HIGHEST 1-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	6.28 (155, 7)	5.71 (163, 9)	5.71 (244,14)	4.83 (341, 9)	4.75 (74,13)
2(17.10, 46.98)	8.45 (185,10)	7.76 (155, 7)	6.13 (341, 9)	5.71 (163, 9)	5.71 (244,14)
3(25.00, 43.30)	8.45 (185,10)	7.49 (243, 7)	7.28 (327,11)	5.71 (74,14)	5.71 (163, 9)
4(32.14, 38.30)	8.84 (251, 9)	8.82 (243, 7)	8.59 (327,11)	8.45 (125,12)	8.45 (185,10)
5(38.30, 32.14)	9.83 (183, 6)	9.83 (251, 9)	9.76 (47, 9)	8.45 (125,12)	5.71 (214, 9)
6(43.30, 25.00)	10.90 (183, 6)	10.61 (194,12)	9.76 (47, 9)	9.75 (26,10)	9.75 (159, 6)
7(46.98, 17.10)	10.61 (194,12)	9.75 (26,10)	9.75 (26,11)	9.75 (159, 6)	8.45 (212,13)
8(49.24, 8.68)	9.75 (26,11)	7.21 (195,14)	5.71 (172, 9)	5.71 (194,10)	4.75 (125,11)
9(50.00, 0.00)	7.21 (195,14)	5.71 (292,12)	4.75 (84,14)	4.75 (128,12)	4.75 (212, 8)
10(49.24, -8.68)	5.71 (292,12)	4.75 (84,14)	4.75 (212, 8)	4.75 (226, 9)	4.75 (194,14)
11(46.98, -17.10)	5.71 (159, 8)	4.75 (74,12)	4.75 (194,14)	4.75 (188,13)	4.05 (116, 9)
12(43.30, -25.00)	5.71 (159, 8)	4.75 (84,13)	4.75 (74,12)	4.75 (297,11)	4.75 (188,13)
13(38.30, -32.14)	8.45 (170,11)	5.71 (159, 8)	5.71 (202, 9)	4.75 (84,13)	4.75 (297,11)
14(32.14, -38.30)	8.31 (170,11)	5.57 (292,13)	5.54 (202, 9)	5.53 (164, 9)	4.75 (297,11)
15(25.00, -43.30)	3.85 (164, 9)	3.71 (292,13)	3.66 (187,15)	3.64 (173, 8)	3.64 (164, 8)
16(17.10, -46.98)	4.44 (203, 8)	4.31 (253,11)	4.18 (292,13)	4.04 (164, 8)	3.77 (266,14)
17(8.68, -49.24)	3.14 (203, 8)	3.09 (253,11)	3.06 (117, 9)	2.93 (164, 8)	2.90 (79,16)
18(0.00, -50.00)	5.83 (198,11)	5.30 (198,12)	2.62 (203, 8)	2.56 (117, 9)	2.44 (237,10)
19(-8.68, -49.24)	6.49 (198,11)	5.88 (198,12)	3.13 (174,11)	3.09 (232, 9)	2.97 (237,10)
20(-17.10, -46.98)	7.97 (198,11)	4.43 (174,11)	4.30 (232, 9)	4.04 (174,10)	1.04 (138,17)
21(-25.00, -43.30)	4.88 (61,12)	4.77 (232, 9)	4.65 (47,10)	4.48 (218, 8)	4.05 (282,11)
22(-32.14, -38.30)	5.43 (61,12)	5.21 (47,10)	4.75 (218, 8)	4.05 (282,11)	1.31 (174,14)
23(-38.30, -32.14)	5.55 (203, 9)	5.51 (139, 9)	4.05 (281,10)	4.05 (282,11)	1.61 (207, 7)
24(-43.30, -25.00)	5.71 (139, 9)	5.71 (218, 9)	5.71 (203, 9)	4.75 (154, 8)	4.75 (153,12)
25(-46.98, -17.10)	5.71 (141, 8)	5.71 (141, 9)	5.71 (218, 9)	4.75 (154, 8)	4.75 (153,12)
26(-49.24, -8.68)	5.51 (141, 9)	5.51 (141, 8)	4.75 (281,11)	4.75 (284,11)	4.75 (153,12)
27(-50.00, 0.00)	9.35 (189,12)	4.73 (102,10)	4.49 (231,10)	4.49 (231, 9)	4.47 (243,10)
28(-49.24, 8.68)	7.83 (189,12)	3.71 (150, 8)	3.66 (172,13)	3.57 (173, 9)	3.51 (102,10)
[illegible](-46.98, 17.10)	3.30 (150, 8)	3.27 (172,13)	[illegible] (212,10)	3.25 (258,10)	3.16 (173, 9)

30(-43.30, 25.00)	2.30 (212,10)	2.29 (150, 8)	2.28 (258,10)	2.28 (274,11)	2.21 (228,15)
31(-38.30, 32.14)	1.68 (219,10)	1.66 (155, 8)	1.65 (274,11)	1.62 (228,15)	1.62 (219, 9)
32(-32.14, 38.30)	2.16 (219,10)	2.14 (155, 8)	2.08 (214,10)	2.08 (172,12)	2.07 (219, 9)
33(-25.00, 43.30)	3.25 (159, 9)	3.24 (155, 8)	3.11 (214,10)	3.11 (172,12)	3.11 (219,11)
34(-17.10, 46.98)	4.28 (159, 9)	4.06 (212,11)	4.05 (219,11)	3.78 (252,11)	3.78 (228, 9)
35(-8.68, 49.24)	4.71 (212,11)	4.70 (251,10)	4.05 (228, 9)	4.05 (202,10)	4.05 (194,15)
36(0.00, 50.00)	4.75 (74,13)	4.75 (251,10)	4.75 (202,14)	4.44 (170, 8)	4.05 (228, 9)
37(17.36, 98.48)	7.57 (341, 9)	6.30 (155, 7)	4.42 (244,14)	4.41 (163, 9)	4.40 (93, 6)
38(34.20, 93.97)	8.31 (341, 9)	6.83 (155, 7)	4.74 (244,14)	4.74 (163, 9)	4.36 (185,10)
39(50.00, 86.60)	9.46 (243, 7)	9.38 (327,11)	4.78 (163, 9)	4.78 (74,14)	4.38 (185,10)
40(64.28, 76.60)	10.10 (251, 9)	10.10 (243, 7)	10.01 (327,11)	7.24 (166, 5)	5.42 (165, 6)
41(76.60, 64.28)	10.74 (251, 9)	10.74 (183, 6)	8.80 (219, 6)	7.97 (47, 9)	7.24 (166, 5)
42(86.60, 50.00)	10.74 (183, 6)	8.80 (219, 6)	7.97 (159, 6)	7.97 (26,10)	7.97 (47, 9)
43(93.97, 34.20)	8.80 (219, 6)	8.58 (47, 8)	7.97 (159, 6)	7.97 (26,11)	7.97 (26,10)
44(98.48, 17.36)	8.39 (332,11)	8.33 (47, 8)	7.97 (26,11)	7.24 (251, 6)	5.99 (195,14)
45(100.00, 0.00)	9.17 (332,11)	9.11 (47, 8)	7.27 (26, 8)	7.24 (303,13)	7.24 (219, 5)
46(98.48, -17.36)	7.97 (310,15)	7.27 (26, 8)	7.24 (303,13)	7.24 (183, 5)	7.24 (187, 6)
47(93.97, -34.20)	6.79 (310,15)	6.73 (332,12)	6.56 (187, 6)	6.56 (183, 5)	5.42 (224, 7)
48(86.60, -50.00)	6.08 (332,12)	6.01 (183, 5)	5.36 (224, 7)	5.33 (307, 9)	5.31 (84,15)
49(76.60, -64.28)	5.28 (332,12)	4.76 (307, 9)	4.74 (84,15)	4.74 (202, 9)	4.73 (159, 8)
50(64.28, -76.60)	6.60 (292,13)	4.61 (202, 9)	4.61 (164, 9)	4.49 (307, 9)	4.29 (170,11)
51(50.00, -86.60)	6.60 (292,13)	5.00 (243, 6)	4.95 (268, 6)	4.61 (164, 9)	4.49 (347,13)
52(34.20, -93.97)	7.54 (219, 8)	6.18 (292,13)	5.15 (203, 8)	4.35 (253,11)	4.34 (268, 6)
53(17.36, -98.48)	5.05 (219, 8)	4.33 (79,16)	3.69 (203, 8)	3.16 (253,11)	3.15 (117, 9)
54(0.00,-100.00)	4.60 (219, 8)	4.59 (228, 8)	4.01 (237,10)	3.98 (79,16)	3.96 (198,11)
55(-17.36, -98.48)	4.38 (228, 8)	3.87 (198,11)	3.84 (237,10)	3.27 (174,11)	3.23 (198,12)
56(-34.20, -93.97)	3.87 (198,11)	3.27 (174,11)	2.81 (232, 9)	2.46 (174,10)	1.58 (268, 7)
57(-50.00, -86.60)	3.78 (47,10)	3.25 (61,12)	2.81 (232, 9)	2.46 (218, 8)	2.17 (282,11)
58(-64.28, -76.60)	3.95 (47,10)	3.39 (61,12)	2.56 (218, 8)	2.26 (282,11)	1.79 (94, 8)
59(-76.60, -64.28)	3.65 (203, 9)	3.64 (139, 9)	2.92 (94, 8)	2.79 (282,11)	2.79 (281,10)
60(-86.60, -50.00)	4.42 (98,11)	4.42 (203, 9)	4.42 (218, 9)	4.41 (139, 9)	4.40 (287, 7)
61(-93.97, -34.20)	4.93 (287, 7)	4.61 (218, 9)	4.60 (141, 9)	4.60 (141, 8)	4.01 (174,15)
62(-98.48, -17.36)	4.28 (141, 9)	4.28 (141, 8)	4.22 (207, 6)	4.19 (341,12)	3.71 (231, 9)
63(-100.00, 0.00)	5.78 (189,12)	5.28 (102,10)	3.28 (231,10)	3.28 (231, 9)	3.28 (243,10)
64(-98.48, 17.36)	5.16 (189,12)	4.36 (173, 9)	4.33 (102,10)	3.68 (150, 8)	3.16 (172,13)
65(-93.97, 34.20)	3.76 (243, 8)	3.35 (173, 9)	3.33 (102,10)	2.87 (150, 8)	2.49 (172,13)
66(-86.60, 50.00)	3.76 (243, 8)	3.33 (26,12)	2.87 (150, 8)	2.87 (274,11)	2.49 (212,10)
67(-76.60, 64.28)	4.15 (203, 6)	3.65 (26,12)	3.64 (93, 7)	3.12 (274,11)	2.70 (219,10)
68(-64.28, 76.60)	4.69 (203, 6)	4.06 (93, 7)	2.99 (219,10)	2.98 (155, 8)	2.61 (214,10)
69(-50.00, 86.60)	4.92 (243, 9)	4.91 (203, 6)	4.23 (93, 7)	3.10 (159, 9)	3.09 (155, 8)
70(-34.20, 93.97)	6.14 (243, 9)	6.14 (180,11)	3.71 (159, 9)	3.23 (212,11)	3.23 (219,11)
71(-17.36, 98.48)	7.38 (170, 8)	7.36 (180,11)	4.19 (341,11)	4.10 (28,16)	4.08 (159, 5)
72(0.00, 100.00)	7.97 (170, 8)	4.77 (28,16)	4.75 (159, 5)	4.75 (93, 6)	4.74 (346, 8)
73(19.33, 46.66)	8.43 (185,10)	8.26 (155, 7)	6.83 (243, 7)	6.65 (341, 9)	5.77 (74,14)
74(55.93, 55.93) *	11.98 (183, 6) *	11.98 (251, 9)	11.82 (327,11)	7.11 (166, 5)	5.99 (125,12)
75(58.11, 24.07)	10.73 (47, 9)	10.73 (26,10)	10.73 (26,11)	10.73 (159, 6)	9.45 (194,12)
76(-108.28, 44.85)	4.00 (243, 8)	3.33 (173, 9)	2.76 (150, 8)	2.35 (172,13)	2.35 (212,10)
77(-33.02, 33.02)	1.51 (219,10)	1.50 (155, 8)	1.49 (214,10)	1.49 (228,15)	1.49 (172,12)
78(-15.31, 36.96)	3.44 (159, 9)	3.22 (219,11)	3.22 (212,11)	2.74 (165, 8)	2.74 (252,11)
79(0.00, 41.00)	3.42 (74,13)	3.42 (251,10)	3.42 (202,14)	2.91 (228, 9)	2.91 (202,10)

FIVE HIGHEST 3-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	2.09 (155, 9)	2.05 (260, 9)	1.90 (163, 9)	1.90 (244,15)	1.61 (341, 9)
2(17.10, 46.98)	2.82 (185,12)	2.59 (155, 9)	2.04 (341, 9)	1.90 (163, 9)	1.90 (244,15)
3(25.00, 43.30)	2.82 (185,12)	2.50 (243, 9)	2.43 (327,12)	1.91 (74,15)	1.90 (163, 9)
4(32.14, 38.30)	3.52 (251, 9)	2.94 (243, 9)	2.86 (327,12)	2.82 (125,12)	2.82 (185,12)

5(38.30,	32.14)	3.85	(251, 9)	3.28	(183, 6)	3.25	(47, 9)	2.82	(125,12)	2.76	(195,12)
6(43.30,	25.00)	7.02	(194,12)	4.17	(212,15)	3.63	(183, 6)	3.25	(47, 9)	3.25	(26,12)
7(46.98,	17.10)	7.02	(194,12)	6.50	(26,12)	4.17	(212,15)	3.25	(159, 6)	2.40	(195,15)
8(49.24,	8.68)	3.25	(26,12)	2.76	(128,12)	2.53	(160,12)	2.40	(195,15)	2.23	(170,12)
9(50.00,	0.00)	2.53	(160,12)	2.40	(195,15)	2.16	(226, 9)	1.90	(292,12)	1.70	(236, 9)
10(49.24,	-8.68)	3.75	(161,12)	2.16	(226, 9)	1.98	(212, 9)	1.90	(292,12)	1.70	(278,12)
11(46.98,	-17.10)	2.48	(159, 9)	2.40	(161,12)	1.70	(163, 9)	1.66	(236,12)	1.58	(74,12)
12(43.30,	-25.00)	2.33	(84,15)	2.16	(297,12)	1.93	(74,12)	1.90	(159, 9)	1.83	(188,15)
13(38.30,	-32.14)	2.82	(170,12)	2.56	(202, 9)	2.28	(84,15)	2.16	(297,12)	1.93	(292,12)
14(32.14,	-38.30)	2.77	(170,12)	2.15	(164, 9)	2.11	(297,12)	1.86	(292,15)	1.85	(202, 9)
15(25.00,	-43.30)	2.50	(164, 9)	1.52	(292,15)	1.42	(252, 9)	1.39	(189, 9)	1.22	(187,15)
16(17.10,	-46.98)	1.74	(292,15)	1.48	(203, 9)	1.44	(253,12)	1.36	(192,12)	1.35	(164, 9)
17(8.68,	-49.24)	1.05	(203, 9)	1.03	(253,12)	1.02	(117, 9)	0.98	(164, 9)	0.97	(79,18)
18(0.00,	-50.00)	4.49	(198,12)	0.98	(203, 9)	0.85	(117, 9)	0.81	(237,12)	0.80	(79,18)
19(-8.68,	-49.24)	5.04	(198,12)	2.02	(174,12)	1.03	(232, 9)	0.99	(237,12)	0.72	(228, 9)
20(-17.10,	-46.98)	2.82	(174,12)	2.66	(198,12)	1.43	(232, 9)	0.35	(138,18)	0.34	(230,12)
21(-25.00,	-43.30)	1.70	(282,12)	1.63	(61,12)	1.59	(232, 9)	1.55	(47,12)	1.49	(218, 9)
22(-32.14,	-38.30)	1.81	(61,12)	1.74	(47,12)	1.70	(282,12)	1.58	(218, 9)	0.44	(174,15)
23(-38.30,	-32.14)	1.85	(203, 9)	1.84	(139, 9)	1.35	(281,12)	1.35	(282,12)	0.54	(207, 9)
24(-43.30,	-25.00)	2.23	(154,12)	2.16	(207, 9)	1.90	(139, 9)	1.90	(218, 9)	1.90	(203, 9)
25(-46.98,	-17.10)	3.81	(141, 9)	2.70	(281,12)	2.23	(154,12)	2.11	(153,12)	1.90	(218, 9)
26(-49.24,	-8.68)	3.67	(141, 9)	2.93	(281,12)	2.23	(154,12)	1.86	(153,12)	1.75	(154, 9)
27(-50.00,	0.00)	3.12	(189,12)	1.85	(102,12)	1.75	(154, 9)	1.50	(231,12)	1.50	(231, 9)
28(-49.24,	8.68)	2.61	(189,12)	1.41	(102,12)	1.32	(123,12)	1.31	(211,12)	1.24	(211,15)
29(-46.98,	17.10)	1.24	(201,15)	1.17	(162,12)	1.17	(123,12)	1.16	(211,12)	1.10	(150, 9)
30(-43.30,	25.00)	1.39	(233,12)	1.38	(142,12)	0.84	(228,15)	0.80	(189,15)	0.80	(162,12)
31(-38.30,	32.14)	1.09	(155, 9)	1.03	(233,12)	0.94	(173,12)	0.66	(228,15)	0.58	(166, 9)
32(-32.14,	38.30)	1.40	(155, 9)	1.34	(219,12)	1.31	(233,12)	1.20	(173,12)	0.80	(117,12)
33(-25.00,	43.30)	1.95	(219,12)	1.30	(117,12)	1.23	(287,12)	1.22	(214,12)	1.17	(165, 9)
34(-17.10,	46.98)	2.53	(219,12)	2.22	(163,12)	1.43	(159, 9)	1.41	(180,12)	1.35	(212,12)
35(-8.68,	49.24)	2.23	(163,12)	1.64	(180,12)	1.57	(212,12)	1.57	(251,12)	1.35	(228, 9)
36(0.00,	50.00)	1.58	(74,15)	1.58	(251,12)	1.58	(202,15)	1.48	(170, 9)	1.35	(228, 9)
37(17.36,	98.48)	2.52	(341, 9)	2.36	(260, 9)	2.10	(155, 9)	1.84	(346, 9)	1.60	(219,15)
38(34.20,	93.97)	2.77	(341, 9)	2.28	(155, 9)	1.84	(219,15)	1.83	(113,12)	1.58	(244,15)
39(50.00,	86.60)	3.15	(243, 9)	3.13	(327,12)	1.88	(74,15)	1.59	(163, 9)	1.46	(185,12)
40(64.28,	76.60)	4.81	(251, 9)	3.37	(243, 9)	3.34	(327,12)	2.55	(165, 6)	2.41	(166, 6)
41(76.60,	64.28)	5.02	(251, 9)	3.58	(183, 6)	2.93	(219, 6)	2.66	(47, 9)	2.64	(41,12)
42(86.60,	50.00)	4.75	(194,12)	3.58	(183, 6)	2.93	(219, 6)	2.66	(159, 6)	2.66	(26,12)
43(93.97,	34.20)	5.31	(26,12)	4.75	(194,12)	2.93	(219, 6)	2.86	(47, 9)	2.66	(159, 6)
44(98.48,	17.36)	2.80	(332,12)	2.78	(47, 9)	2.66	(26,12)	2.41	(251, 6)	2.33	(128,12)
45(100.00,	0.00)	3.46	(332,12)	3.04	(47, 9)	2.77	(226, 9)	2.45	(219, 6)	2.42	(26, 9)
46(98.48,	-17.36)	3.71	(310,15)	3.16	(161,12)	2.77	(226, 9)	2.43	(26, 9)	2.42	(219, 6)
47(93.97,	-34.20)	3.03	(159, 9)	2.65	(332,12)	2.26	(310,15)	2.21	(363,12)	2.19	(187, 6)
48(86.60,	-50.00)	3.10	(84,15)	2.77	(297,12)	2.40	(340,15)	2.26	(307, 9)	2.23	(74,12)
49(76.60,	-64.28)	3.28	(202, 9)	2.91	(84,15)	2.74	(297,12)	2.54	(292,12)	2.23	(46,15)
50(64.28,	-76.60)	2.65	(297,12)	2.38	(323,12)	2.34	(164, 9)	2.21	(46,15)	2.21	(58, 9)
51(50.00,	-86.60)	3.23	(292,15)	2.86	(164, 9)	2.04	(252, 9)	1.83	(333,12)	1.79	(189, 9)
52(34.20,	-93.97)	3.01	(292,15)	3.01	(347,12)	2.51	(219, 9)	1.85	(297, 9)	1.72	(203, 9)
53(17.36,	-98.48)	1.68	(219, 9)	1.61	(347,12)	1.44	(79,18)	1.23	(203, 9)	1.05	(253,12)
54(0.00,	-100.00)	3.18	(198,12)	1.71	(203, 9)	1.53	(219, 9)	1.53	(228, 9)	1.34	(237,12)
55(-17.36,	-98.48)	3.09	(198,12)	1.91	(174,12)	1.46	(228, 9)	1.28	(237,12)	0.98	(225, 9)
56(-34.20,	-93.97)	1.91	(174,12)	1.29	(198,12)	0.94	(232, 9)	0.53	(268, 9)	0.52	(154, 6)
57(-50.00,	-86.60)	1.26	(47,12)	1.10	(282,12)	1.08	(61,12)	0.94	(232, 9)	0.82	(218, 9)
58(-64.28,	-76.60)	1.32	(47,12)	1.16	(282,12)	1.13	(61,12)	0.85	(218, 9)	0.60	(94, 9)
59(-76.60,	-64.28)	1.22	(203, 9)	1.21	(139, 9)	0.97	(94, 9)	0.93	(282,12)	0.93	(281,12)
60(-86.60,	-50.00)	2.60	(174,15)	2.50	(207, 9)	1.92	(153,12)	1.88	(154,12)	1.69	(158, 9)
61(-93.97,	-34.20)	3.07	(141, 9)	2.70	(153,12)	2.42	(158, 9)	2.32	(153,15)	2.27	(281,12)
62(-98.48,	-17.36)	2.85	(141, 9)	2.32	(281,12)	2.14	(223,12)	2.01	(154, 9)	1.97	(225,12)
63(-100.00,	0.00)	2.32	(102,12)	1.93	(189,12)	1.69	(154, 9)	1.58	(225,12)	1.38	(211,15)
64(-98.48,	17.36)	1.85	(102,12)	1.72	(189,12)	45	(173, 9)	1.25	(123,12)	1.23	(150, 9)

65(-93.97, 34.20)	1.25 (243, 9)	1.12 (173, 9)	1.11 (102,12)	1.08 (201,15)	0.96 (150, 9)
66(-86.60, 50.00)	1.31 (142,12)	1.29 (233,12)	1.25 (243, 9)	1.11 (26,12)	0.97 (228,15)
67(-76.60, 64.28)	1.69 (155, 9)	1.40 (233,12)	1.38 (203, 6)	1.35 (228,15)	1.27 (166, 9)
68(-64.28, 76.60)	1.86 (155, 9)	1.68 (219,12)	1.56 (203, 6)	1.54 (233,12)	1.44 (117,12)
69(-50.00, 86.60)	1.64 (243, 9)	1.64 (203, 6)	1.62 (219,12)	1.53 (117,12)	1.41 (93, 9)
70(-34.20, 93.97)	2.69 (180,12)	2.05 (243, 9)	1.92 (219,12)	1.61 (163,12)	1.24 (159, 9)
71(-17.36, 98.48)	3.30 (180,12)	2.46 (170, 9)	1.84 (163,12)	1.59 (102, 9)	1.48 (155, 6)
72(0.00, 100.00)	2.66 (170, 9)	2.02 (346, 9)	1.74 (155, 6)	1.59 (28,18)	1.58 (159, 6)
73(19.33, 46.66)	2.81 (185,12)	2.75 (155, 9)	2.28 (243, 9)	2.22 (341, 9)	1.92 (74,15)
74(55.93, 55.93)	5.39 (251, 9)	3.99 (183, 6)	3.94 (327,12)	2.87 (195,12)	2.56 (41,12)
75(58.11, 24.07) *	7.15 (26,12) *	7.05 (194,12)	4.03 (212,15)	3.90 (214, 9)	3.58 (47, 9)
76(-108.28, 44.85)	1.33 (243, 9)	1.27 (166, 9)	1.11 (173, 9)	1.09 (201,15)	0.92 (150, 9)
77(-33.02, 33.02)	0.99 (155, 9)	0.96 (287,12)	0.95 (233,12)	0.91 (159,12)	0.88 (173,12)
78(-15.31, 36.96)	1.87 (219,12)	1.15 (159, 9)	1.07 (212,12)	0.91 (165, 9)	0.91 (252,12)
79(0.00, 41.00)	1.14 (74,15)	1.14 (251,12)	1.14 (202,15)	0.97 (228, 9)	0.97 (202,12)

FIVE HIGHEST 8-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	1.10 (202,16)	0.79 (155, 8)	0.71 (163,16)	0.71 (244,16)	0.70 (260,16)
2(17.10, 46.98)	1.06 (185,16)	0.97 (155, 8)	0.77 (341,16)	0.71 (163,16)	0.71 (244,16)
3(25.00, 43.30)	1.06 (185,16)	0.94 (243, 8)	0.91 (327,16)	0.72 (74,16)	0.71 (163,16)
4(32.14, 38.30)	1.16 (125,16)	1.10 (251,16)	1.10 (243, 8)	1.07 (327,16)	1.06 (185,16)
5(38.30, 32.14)	1.44 (183, 8)	1.23 (251,16)	1.22 (47,16)	1.16 (125,16)	1.04 (195,16)
6(43.30, 25.00)	2.76 (194,16)	1.58 (183, 8)	1.56 (212,16)	1.22 (47,16)	1.22 (26,16)
7(46.98, 17.10)	2.76 (194,16)	2.44 (26,16)	1.56 (212,16)	1.41 (195,16)	1.22 (159, 8)
8(49.24, 8.68)	1.22 (26,16)	1.04 (128,16)	1.04 (160,16)	0.95 (170,16)	0.90 (195,16)
9(50.00, 0.00)	1.21 (160,16)	1.13 (236,16)	1.13 (79,16)	1.00 (138,16)	0.90 (195,16)
10(49.24, -8.68)	1.41 (161,16)	1.27 (188,16)	1.13 (79,16)	1.02 (236,16)	1.00 (138,16)
11(46.98, -17.10)	1.27 (188,16)	1.13 (236,16)	1.05 (161,16)	1.03 (220,16)	0.93 (159, 8)
12(43.30, -25.00)	1.13 (220,16)	1.11 (84,16)	1.09 (297,16)	1.08 (188,16)	0.72 (74,16)
13(38.30, -32.14)	1.06 (170,16)	0.96 (84,16)	0.96 (297,16)	0.72 (292,16)	0.71 (159, 8)
14(32.14, -38.30)	1.21 (292,16)	1.04 (170,16)	0.94 (297,16)	0.80 (187,16)	0.76 (46,16)
15(25.00, -43.30)	0.67 (292,16)	0.65 (187,16)	0.53 (189,16)	0.50 (192,16)	0.48 (164,16)
16(17.10, -46.98)	0.78 (292,16)	0.56 (266,16)	0.55 (203, 8)	0.54 (253,16)	0.51 (192,16)
17(8.68, -49.24)	0.41 (266,16)	0.39 (203, 8)	0.39 (253,16)	0.38 (117,16)	0.37 (164, 8)
18(0.00, -50.00)	1.68 (198,16)	0.37 (203, 8)	0.32 (117,16)	0.31 (237,16)	0.30 (79,16)
19(-8.68, -49.24)	1.89 (198,16)	0.76 (174,16)	0.39 (232,16)	0.37 (237,16)	0.27 (228, 8)
20(-17.10, -46.98)	1.06 (174,16)	1.00 (198,16)	0.54 (232,16)	0.13 (138,24)	0.13 (230,16)
21(-25.00, -43.30)	0.75 (282,16)	0.61 (61,16)	0.60 (232,16)	0.58 (47,16)	0.56 (218, 8)
22(-32.14, -38.30)	0.68 (61,16)	0.65 (47,16)	0.64 (282,16)	0.59 (218, 8)	0.16 (174,16)
23(-38.30, -32.14)	0.69 (203,16)	0.69 (139,16)	0.51 (281,16)	0.51 (282,16)	0.22 (153,16)
24(-43.30, -25.00)	0.84 (154,16)	0.82 (153,16)	0.81 (207, 8)	0.71 (139,16)	0.71 (218,16)
25(-46.98, -17.10)	1.56 (153,16)	1.01 (281,16)	0.86 (141,16)	0.84 (154,16)	0.81 (174,16)
26(-49.24, -8.68)	1.74 (154,16)	1.33 (153,16)	1.10 (281,16)	0.97 (141,16)	0.85 (88,16)
27(-50.00, 0.00)	1.17 (189,16)	1.12 (231,16)	0.90 (154,16)	0.70 (102,16)	0.56 (243,16)
28(-49.24, 8.68)	1.03 (173,16)	0.98 (189,16)	0.96 (211,16)	0.59 (123,16)	0.53 (102,16)
29(-46.98, 17.10)	0.76 (173,16)	0.51 (123,16)	0.51 (162,16)	0.51 (211,16)	0.46 (201,16)
30(-43.30, 25.00)	0.52 (233,16)	0.52 (142,16)	0.34 (26,16)	0.34 (162,16)	0.31 (228,16)
31(-38.30, 32.14)	0.41 (219,16)	0.41 (274,16)	0.40 (224,16)	0.39 (155,16)	0.38 (233,16)
32(-32.14, 38.30)	0.76 (219,16)	0.51 (224,16)	0.49 (233,16)	0.45 (173,16)	0.33 (117,16)
33(-25.00, 43.30)	0.75 (159,16)	0.73 (219,16)	0.49 (117,16)	0.47 (172,16)	0.46 (287,16)
34(-17.10, 46.98)	0.95 (219,16)	0.83 (163,16)	0.53 (159,16)	0.53 (180,16)	0.51 (212,16)
35(-8.68, 49.24)	0.84 (163,16)	0.62 (180,16)	0.59 (212,16)	0.59 (251,16)	0.51 (228,16)
36(0.00, 50.00)	1.10 (202,16)	0.60 (251,16)	0.59 (74,16)	0.56 (170, 8)	0.51 (228,16)
37(17.36, 98.48)	0.95 (341,16)	0.91 (152, 8)	0.90 (202,16)	0.83 (346, 8)	0.79 (155, 8)
38(34.20, 93.97)	1.04 (341,16)	0.85 (155, 8)	0.74 (234, 8)	0.72 (209, 8)	0.69 (263,16)
39(50.00, 86.60)	1.18 (243, 8)	1.17 (327,16)	0.77 (239, 8)	0.70 (74,16)	0.60 (163,16)

40(64.28, 76.60)	1.51 (172, 8)	1.26 (251,16)	1.26 (243, 8)	1.25 (327,16)	1.09 (270,16)
41(76.60, 64.28)	1.88 (183, 8)	1.78 (219, 8)	1.34 (251,16)	1.29 (41,16)	1.18 (270,16)
42(86.60, 50.00)	2.12 (194,16)	1.88 (183, 8)	1.78 (219, 8)	1.54 (41,16)	1.48 (251, 8)
43(93.97, 34.20)	2.12 (194,16)	1.99 (26,16)	1.18 (195,16)	1.13 (119,16)	1.11 (219, 8)
44(98.48, 17.36)	1.46 (25,16)	1.33 (332,16)	1.11 (160,16)	1.08 (170,16)	1.06 (58,16)
45(100.00, 0.00)	1.55 (160,16)	1.47 (329,16)	1.42 (332,16)	1.33 (128,16)	1.30 (236,16)
46(98.48, -17.36)	1.58 (188,16)	1.39 (310,16)	1.29 (161,16)	1.24 (329,16)	1.24 (128,16)
47(93.97, -34.20)	1.58 (188,16)	1.48 (194, 8)	1.45 (332,16)	1.17 (5,16)	1.16 (187, 8)
48(86.60, -50.00)	1.84 (84,16)	1.76 (297,16)	1.61 (340,16)	1.43 (332,16)	1.37 (220,16)
49(76.60, -64.28)	1.62 (46,16)	1.44 (84,16)	1.41 (297,16)	1.38 (340,16)	1.31 (332,16)
50(64.28, -76.60)	1.95 (46,16)	1.40 (292,16)	1.38 (297,16)	1.21 (296,16)	1.04 (187,16)
51(50.00, -86.60)	1.55 (292,16)	1.06 (347,16)	1.01 (187,16)	0.99 (333,16)	0.90 (11,16)
52(34.20, -93.97)	1.62 (347,16)	1.46 (292,16)	0.94 (219, 8)	0.74 (9,24)	0.73 (10,16)
53(17.36, -98.48)	0.85 (347,16)	0.63 (219, 8)	0.54 (79,16)	0.47 (266,16)	0.46 (203, 8)
54(0.00,-100.00)	1.19 (198,16)	0.64 (203, 8)	0.58 (219, 8)	0.57 (228, 8)	0.54 (20,16)
55(-17.36, -98.48)	1.16 (198,16)	0.72 (174,16)	0.55 (228, 8)	0.48 (237,16)	0.38 (203, 8)
56(-34.20, -93.97)	0.72 (174,16)	0.48 (198,16)	0.35 (232,16)	0.20 (268, 8)	0.20 (154, 8)
57(-50.00, -86.60)	0.55 (282,16)	0.47 (47,16)	0.41 (61,16)	0.35 (232,16)	0.31 (218, 8)
58(-64.28, -76.60)	0.49 (47,16)	0.44 (282,16)	0.42 (61,16)	0.32 (218, 8)	0.22 (94, 8)
59(-76.60, -64.28)	0.46 (203,16)	0.46 (139,16)	0.44 (94, 8)	0.42 (153,16)	0.35 (282,16)
60(-86.60, -50.00)	1.06 (153,16)	0.97 (174,16)	0.97 (205,16)	0.94 (207, 8)	0.71 (157,16)
61(-93.97, -34.20)	2.22 (153,16)	1.06 (205,16)	1.00 (174,16)	0.96 (141,16)	0.85 (281,16)
62(-98.48, -17.36)	1.56 (153,16)	1.42 (154,16)	1.30 (141,16)	1.27 (88,16)	1.17 (206,16)
63(-100.00, 0.00)	0.95 (206,16)	0.92 (102,16)	0.82 (231,16)	0.76 (232,16)	0.75 (225,16)
64(-98.48, 17.36)	1.18 (173,16)	0.91 (211,16)	0.73 (123,16)	0.71 (102,16)	0.64 (189,16)
65(-93.97, 34.20)	0.66 (173,16)	0.48 (123,16)	0.47 (243, 8)	0.44 (162,16)	0.42 (211,16)
66(-86.60, 50.00)	0.67 (26,16)	0.49 (233,16)	0.49 (142,16)	0.47 (243, 8)	0.44 (162,16)
67(-76.60, 64.28)	0.69 (274,16)	0.65 (224,16)	0.63 (219,16)	0.63 (228,16)	0.62 (155,16)
68(-64.28, 76.60)	0.96 (219,16)	0.72 (224,16)	0.70 (117,16)	0.59 (178,16)	0.59 (203, 8)
69(-50.00, 86.60)	0.66 (159,16)	0.61 (243,16)	0.61 (203, 8)	0.61 (219,16)	0.57 (117,16)
70(-34.20, 93.97)	1.01 (180,16)	0.77 (243,16)	0.72 (219,16)	0.61 (129, 8)	0.60 (163,16)
71(-17.36, 98.48)	1.24 (180,16)	0.92 (170, 8)	0.75 (28,16)	0.74 (168,24)	0.69 (163,16)
72(0.00, 100.00)	1.00 (170, 8)	0.92 (202,16)	0.91 (346, 8)	0.89 (168,24)	0.86 (28,16)
73(19.33, 46.66)	1.05 (185,16)	1.03 (155, 8)	0.85 (243, 8)	0.83 (341,16)	0.72 (74,16)
74(55.93, 55.93)	1.50 (183, 8)	1.50 (251,16)	1.48 (327,16)	1.38 (172, 8)	1.19 (270,16)
75(58.11, 24.07) *	2.89 (194,16) *	2.68 (26,16)	1.51 (212,16)	1.34 (47,16)	1.34 (159, 8)
76(-108.28, 44.85)	0.64 (173,16)	0.50 (243, 8)	0.46 (162,16)	0.46 (174,16)	0.42 (139,16)
77(-33.02, 33.02)	0.38 (274,16)	0.37 (219,16)	0.36 (224,16)	0.36 (287,16)	0.36 (159,16)
78(-15.31, 36.96)	0.70 (219,16)	0.43 (159,16)	0.40 (212,16)	0.34 (165, 8)	0.34 (252,16)
79(0.00, 41.00)	0.79 (202,16)	0.43 (74,16)	0.43 (251,16)	0.36 (228,16)	0.36 (194,16)

FIVE HIGHEST 24-HOUR SO2 CONCENTRATIONS((ENDING ON JULIAN DAY, HOUR)
(MICROGRAMS/M**3)

RECEPTOR	1	2	3	4	5
1(8.68, 49.24)	0.37 (202,24)	0.29 (260,24)	0.26 (155,24)	0.24 (163,24)	0.24 (244,24)
2(17.10, 46.98)	0.40 (185,24)	0.33 (155,24)	0.26 (341,24)	0.24 (163,24)	0.24 (244,24)
3(25.00, 43.30)	0.41 (185,24)	0.31 (243,24)	0.30 (327,24)	0.24 (163,24)	0.24 (74,24)
4(32.14, 38.30)	0.44 (251,24)	0.41 (185,24)	0.39 (125,24)	0.37 (243,24)	0.36 (327,24)
5(38.30, 32.14)	0.62 (183,24)	0.48 (251,24)	0.41 (47,24)	0.39 (125,24)	0.35 (195,24)
6(43.30, 25.00)	0.92 (194,24)	0.71 (183,24)	0.52 (212,24)	0.41 (159,24)	0.41 (47,24)
7(46.98, 17.10)	0.96 (194,24)	0.81 (26,24)	0.52 (212,24)	0.47 (195,24)	0.41 (159,24)
8(49.24, 8.68)	0.42 (160,24)	0.41 (26,24)	0.35 (128,24)	0.32 (170,24)	0.30 (195,24)
9(50.00, 0.00)	0.48 (160,24)	0.42 (236,24)	0.38 (79,24)	0.33 (138,24)	0.30 (226,24)
10(49.24, -8.68)	0.47 (161,24)	0.43 (188,24)	0.38 (79,24)	0.34 (236,24)	0.33 (138,24)
11(46.98, -17.10)	0.43 (188,24)	0.38 (236,24)	0.37 (194,24)	0.35 (161,24)	0.35 (220,24)
12(43.30, -25.00)	0.38 (220,24)	0.37 (84,24)	0.36 (297,24)	0.36 (188,24)	0.31 (202,24)
13(38.30, -32.14)	0.35 (170,24)	0.32 (202,24)	0.32 (84,24)	0.32 (297,24)	0.26 (194,24)
32.14, -38.30)	0.40 (292,24)	0.39 (170,24)	0.3 97,24)	0.27 (164,24)	0.27 (187,24)

15(25.00, -43.30)	0.31	(164,24)	0.22	(292,24)	0.22	(187,24)	0.21	(189,24)	0.18	(252,24)
16(17.10, -46.98)	0.26	(292,24)	0.19	(266,24)	0.18	(203,24)	0.18	(253,24)	0.18	(189,24)
17(8.68, -49.24)	0.14	(266,24)	0.14	(198,24)	0.13	(203,24)	0.13	(253,24)	0.13	(117,24)
18(0.00, -50.00)	0.58	(198,24)	0.12	(203,24)	0.11	(117,24)	0.10	(237,24)	0.10	(79,24)
19(-8.68, -49.24)	0.63	(198,24)	0.28	(174,24)	0.13	(232,24)	0.12	(237,24)	0.09	(228,24)
20(-17.10, -46.98)	0.35	(174,24)	0.33	(198,24)	0.18	(232,24)	0.04	(138,24)	0.04	(230,24)
21(-25.00, -43.30)	0.25	(282,24)	0.20	(61,24)	0.20	(232,24)	0.19	(47,24)	0.19	(218,24)
22(-32.14, -38.30)	0.23	(61,24)	0.22	(47,24)	0.21	(282,24)	0.20	(218,24)	0.05	(174,24)
23(-38.30, -32.14)	0.23	(139,24)	0.23	(203,24)	0.17	(281,24)	0.17	(282,24)	0.11	(153,24)
24(-43.30, -25.00)	0.48	(154,24)	0.27	(153,24)	0.27	(207,24)	0.24	(139,24)	0.24	(218,24)
25(-46.98, -17.10)	0.53	(141,24)	0.52	(153,24)	0.48	(154,24)	0.34	(281,24)	0.27	(174,24)
26(-49.24, -8.68)	0.63	(154,24)	0.55	(141,24)	0.45	(153,24)	0.37	(281,24)	0.28	(88,24)
27(-50.00, 0.00)	0.39	(189,24)	0.37	(231,24)	0.35	(154,24)	0.23	(102,24)	0.23	(211,24)
28(-49.24, 8.68)	0.38	(173,24)	0.33	(189,24)	0.32	(211,24)	0.22	(150,24)	0.20	(123,24)
29(-46.98, 17.10)	0.25	(173,24)	0.19	(150,24)	0.17	(123,24)	0.17	(162,24)	0.17	(211,24)
30(-43.30, 25.00)	0.17	(233,24)	0.17	(142,24)	0.11	(26,24)	0.11	(189,24)	0.11	(162,24)
31(-38.30, 32.14)	0.20	(155,24)	0.14	(219,24)	0.14	(274,24)	0.13	(224,24)	0.13	(233,24)
32(-32.14, 38.30)	0.25	(219,24)	0.18	(165,24)	0.18	(155,24)	0.17	(224,24)	0.16	(233,24)
33(-25.00, 43.30)	0.25	(159,24)	0.24	(219,24)	0.16	(117,24)	0.16	(172,24)	0.15	(287,24)
34(-17.10, 46.98)	0.32	(219,24)	0.28	(163,24)	0.18	(159,24)	0.18	(180,24)	0.17	(212,24)
35(-8.68, 49.24)	0.28	(163,24)	0.21	(180,24)	0.20	(212,24)	0.20	(251,24)	0.17	(202,24)
36(0.00, 50.00)	0.37	(202,24)	0.20	(251,24)	0.20	(74,24)	0.19	(170,24)	0.17	(228,24)
37(17.36, 98.48)	0.47	(209,24)	0.47	(271,24)	0.45	(229,24)	0.40	(155,24)	0.39	(260,24)
38(34.20, 93.97)	0.46	(209,24)	0.45	(263,24)	0.42	(155,24)	0.40	(229,24)	0.36	(271,24)
39(50.00, 86.60)	0.55	(243,24)	0.45	(327,24)	0.42	(239,24)	0.36	(263,24)	0.33	(185,24)
40(64.28, 76.60)	0.64	(251,24)	0.63	(172,24)	0.47	(270,24)	0.47	(327,24)	0.47	(243,24)
41(76.60, 64.28)	0.98	(183,24)	0.70	(219,24)	0.67	(251,24)	0.62	(255,24)	0.61	(25,24)
42(86.60, 50.00)	1.06	(183,24)	0.87	(194,24)	0.76	(119,24)	0.67	(219,24)	0.64	(25,24)
43(93.97, 34.20)	0.98	(194,24)	0.70	(25,24)	0.67	(26,24)	0.51	(160,24)	0.49	(295,24)
44(98.48, 17.36)	0.69	(160,24)	0.49	(25,24)	0.48	(136,24)	0.46	(194,24)	0.44	(332,24)
45(100.00, 0.00)	0.91	(160,24)	0.60	(236,24)	0.53	(329,24)	0.53	(128,24)	0.50	(136,24)
46(98.48, -17.36)	0.65	(160,24)	0.61	(128,24)	0.59	(188,24)	0.56	(310,24)	0.50	(183,24)
47(93.97, -34.20)	0.70	(194,24)	0.56	(188,24)	0.53	(332,24)	0.48	(187,24)	0.48	(183,24)
48(86.60, -50.00)	0.80	(84,24)	0.59	(297,24)	0.58	(340,24)	0.56	(220,24)	0.53	(332,24)
49(76.60, -64.28)	0.66	(46,24)	0.59	(265,24)	0.56	(73,24)	0.54	(58,24)	0.52	(84,24)
50(64.28, -76.60)	0.81	(46,24)	0.49	(297,24)	0.49	(73,24)	0.47	(292,24)	0.46	(333,24)
51(50.00, -86.60)	0.57	(11,24)	0.52	(292,24)	0.48	(333,24)	0.45	(46,24)	0.41	(192,24)
52(34.20, -93.97)	0.54	(347,24)	0.51	(292,24)	0.50	(10,24)	0.40	(192,24)	0.39	(297,24)
53(17.36, -98.48)	0.28	(347,24)	0.21	(79,24)	0.21	(219,24)	0.19	(297,24)	0.16	(266,24)
54(0.00,-100.00)	0.44	(198,24)	0.21	(203,24)	0.19	(219,24)	0.19	(228,24)	0.19	(20,24)
55(-17.36, -98.48)	0.39	(198,24)	0.29	(174,24)	0.18	(228,24)	0.16	(237,24)	0.13	(203,24)
56(-34.20, -93.97)	0.24	(174,24)	0.16	(198,24)	0.12	(232,24)	0.08	(103,24)	0.07	(268,24)
57(-50.00, -86.60)	0.18	(282,24)	0.16	(47,24)	0.14	(61,24)	0.12	(232,24)	0.10	(218,24)
58(-64.28, -76.60)	0.16	(47,24)	0.15	(282,24)	0.14	(61,24)	0.11	(218,24)	0.07	(94,24)
59(-76.60, -64.28)	0.25	(177,24)	0.23	(153,24)	0.23	(139,24)	0.22	(176,24)	0.19	(249,24)
60(-86.60, -50.00)	0.45	(177,24)	0.44	(153,24)	0.42	(205,24)	0.40	(147,24)	0.39	(154,24)
61(-93.97, -34.20)	0.83	(153,24)	0.63	(186,24)	0.54	(205,24)	0.51	(141,24)	0.46	(145,24)
62(-98.48, -17.36)	0.61	(141,24)	0.59	(154,24)	0.56	(153,24)	0.50	(205,24)	0.49	(186,24)
63(-100.00, 0.00)	0.43	(211,24)	0.36	(206,24)	0.35	(154,24)	0.32	(102,24)	0.27	(231,24)
64(-98.48, 17.36)	0.45	(173,24)	0.33	(211,24)	0.33	(102,24)	0.28	(150,24)	0.26	(123,24)
65(-93.97, 34.20)	0.22	(173,24)	0.20	(150,24)	0.19	(102,24)	0.19	(243,24)	0.16	(123,24)
66(-86.60, 50.00)	0.22	(26,24)	0.19	(243,24)	0.19	(207,24)	0.17	(233,24)	0.16	(142,24)
67(-76.60, 64.28)	0.32	(155,24)	0.32	(203,24)	0.24	(274,24)	0.24	(178,24)	0.22	(224,24)
68(-64.28, 76.60)	0.35	(178,24)	0.32	(219,24)	0.26	(165,24)	0.24	(224,24)	0.23	(117,24)
69(-50.00, 86.60)	0.26	(178,24)	0.22	(159,24)	0.20	(243,24)	0.20	(203,24)	0.20	(219,24)
70(-34.20, 93.97)	0.34	(180,24)	0.26	(243,24)	0.24	(219,24)	0.22	(129,24)	0.20	(163,24)
71(-17.36, 98.48)	0.41	(180,24)	0.34	(168,24)	0.31	(170,24)	0.28	(342,24)	0.26	(151,24)
72(0.00, 100.00)	0.41	(168,24)	0.35	(202,24)	0.33	(170,24)	0.32	(229,24)	0.30	(346,24)
73(19.33, 46.66)	0.40	(185,24)	0.35	(155,24)	0.29	(243,24)	0.28	(341,24)	0.24	(74,24)
74(55.93, 55.93)	0.74	(183,24)	0.69	(251,24)	0.61	(172,24)	0.56	(156,24)	0.56	(270,24)

75(58.11,	24.07) *	1.06	(194,24) *	0.89	(26,24)	0.52	(212,24)	0.50	(214,24)	0.46	(159,24)
76(-108.28,	44.85)	0.23	(166,24)	0.21	(173,24)	0.21	(150,24)	0.21	(243,24)	0.16	(174,24)
77(-33.02,	33.02)	0.13	(274,24)	0.12	(219,24)	0.12	(155,24)	0.12	(224,24)	0.12	(287,24)
78(-15.31,	36.96)	0.23	(219,24)	0.14	(159,24)	0.13	(212,24)	0.11	(165,24)	0.11	(252,24)
79(0.00,	41.00)	0.26	(202,24)	0.14	(74,24)	0.14	(251,24)	0.12	(228,24)	0.12	(194,24)

CHAPTER 5

SITE HISTORY AND INVESTIGATIONS

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CHAPTER 5
SITE HISTORY AND INVESTIGATIONS

5.1 INTRODUCTION

The purpose of this chapter is to provide a summary description of the data and information obtained by Golder Associates Inc. (Golder) and others to support the Remedial Design for the Industri-Plex Site (the Site) in Woburn, Massachusetts. The sources from which information was obtained are listed in the references at the end of this chapter. These references should be consulted for further details.

5.2 LOCATION

The Site is a 248 (+/-) acre area, located about 10 miles northwest of Boston, Massachusetts, in the north part of the City of Woburn, within the Aberjona River Valley (see Figure 5-1). The Site is bounded on the east side by Interstate 93, and Interstate 95/State Route 128 is located about one-half mile south of the Site. The Boston Edison Power Company Right-of-Way No. 9 is the southwest boundary of the Site. The Massachusetts Bay Transportation Authority (MBTA) railway transects roughly the western third of the Site in a northwest-southeast direction.

The Site and property boundaries were surveyed by SAIC Engineering, Inc. (1990a), and are shown on Sheet 5-1. The northern fence line of the Site was resurveyed by SAIC Engineering, Inc. in January 1991 following its relocation in accordance with Section III of the Consent Decree.

5.3 SITE HISTORY

The detailed history of ownership and manufacturing activities at the Site has been reported by Stauffer Chemical Company (Stauffer, 1983, 1984, and 1985) and the U.S. Environmental Protection Agency (USEPA, 1986a). The Site history and conclusions presented in those reports are summarized in this section.

Prior to 1853 the property was undeveloped with forest cover along the northern border, wetlands to the north and on the southern two-thirds of the Site. The history from 1853 to date may be divided into four separate periods according to land use as follows:

- Chemical Manufacturing (1853 to 1934);
- Glue Manufacturing (1934 to 1969);
- Land Development (1968 to 1980); and,
- Remediation (1980 to date).

In the following discussion of Site history, the term "Site" refers to the present 248 (+/-) acres within the current boundary of the Industri-Plex Site. The part of the Site which is known to have been occupied by chemical and/or glue manufacturing industries is approximately as shown on Figure 5-2. This area is roughly 95 acres, which is about 38 percent of the Site. Previous investigations have not identified any chemical and glue manufacturing industries within the part of the Site between Commerce Way and Interstate 93.

5.3.1 Chemical Manufacturing

Several chemical manufacturing companies occupied part of the Site during the period from 1853 to 1934.

The first recorded industry established at the Site was the Woburn Chemical Works which was founded in 1853 and operated until 1863. Manufactured products included sulfuric acid, hydrochloric acid, sodium sulfate, soda ash, tin chloride and copper sulfate. In 1863, the Woburn Chemical Works was merged into the Merrimac Chemical Company. Between 1899 and 1915 Merrimac became the leading U.S. producer of arsenic insecticides.

In 1915, Merrimac Chemical Company established a separate company called the New England Manufacturing Company. A plant was built for the purpose of producing munitions for World War I. Chemicals produced by New England Manufacturing Company from 1915 to 1920 included phenol, benzene, picric acid, and toluene. A TNT plant was built on the Site but blew up prior to full operation. The extent of the Merrimac Chemical Company and New England Manufacturing Company plant facilities existing in 1918 are shown on Figure 5-3. By 1929, Merrimac Chemical Company had become one of the largest chemical manufacturing companies in the United States. The Woburn plant consisted of 90 buildings which occupied 417 acres, some of which were within the current Site boundary.

In 1929, the Monsanto Chemical Works purchased the Merrimac Chemical Company. Merrimac Chemical Company continued to operate the Woburn facility until 1931 as the Merrimac Division of Monsanto. By 1931, Merrimac's operation at Woburn was consolidated into another plant at Everett, Massachusetts, and from 1931 to 1934 no products were manufactured at the Woburn plant. The equipment was salvaged, and in 1934 the property was sold to New England Chemical Industries.

Raw materials used in chemical manufacturing operations on the Site are believed to include lead, arsenic, sulfur, pyrite ore (containing heavy metals), and dry colors (probably containing other metals). Waste metals included arsenic, chromium, lead, zinc, and copper. It is believed that wastes from the manufacturing operations were disposed of in low-lying, swampy areas and in areas near the plant buildings.

5.3.2 Glue Manufacturing

During the period from 1934 to 1969, the Woburn property was used by several companies for manufacturing animal glue. New England Chemical Industries began glue production in 1935, and was purchased by Consolidated Chemical Company in 1936. Consolidated Chemical Company was purchased by Stauffer Chemical Company in 1961.

Stauffer Chemical Company owned about 184 acres in the northwest part of the present Site. Stauffer Chemical Company sold about 149 acres to the Mark-Phillip Trust in late 1968, and the remaining 35 acres were sold to others in the early 1970's. Stauffer Chemical Company produced animal glue and grease until mid-1969 when they removed their equipment and vacated the property.

The glue manufacturing process utilized raw animal hides and bones, and also waste chrome-tanned hides from local industries. Glue was extracted from the hides by cooking in water and concentrating the extract by evaporation and drying. Sodium hydroxide, lime, sulfuric acid, magnesium carbonate, and wood chips were used in the manufacturing process. The materials remaining after cooking, consisting of wood shavings, raw products and hide residue materials (referred to as "tankage"), were buried on the property together with the sludge from the primary waste water settling lagoons (later referred to as the Chromium Lagoons) and other refuse. The waste deposits accumulated over 35 years of animal glue manufacturing resulted in large piles of hide residue and other wastes. These piles have since been referred to as "Hide Piles." The deposits now known as the "East Central Hide Pile" and the "South Hide Pile" originated during this period. However, the configuration of the South Hide Pile was modified during subsequent land development activities.

5.3.3 Land Development

The Mark-Phillip Trust intended to develop the land purchased from Stauffer Chemical Company, together with property which they owned south and east of the former plant, as an industrial park called Industri-Plex 128. Phased development, including grading, began in the early 1970's south of the Industri-Plex Site. Development progressed northward and reached the southern edge of the Site in about 1975.

Hide residues and other materials were excavated from the south end of the Site and deposited in two new hide piles near the north end of the Site. These have since been referred to as the East and West Hide Piles. Hide residue and other materials were also deposited along the Boston Edison Right-of-Way No. 9 at the southwest edge of the Site.

In 1979, the Federal Government became involved with the Site when the U.S. Attorney's office filed suit against the Mark-Phillip Trust on behalf of the U.S. Army Corps of Engineers and USEPA. The suit alleged violations of the Federal Water Pollution Control Act, which regulates the filling of wetlands. A court injunction was issued in July, 1979 and development work ceased.

Negotiations began between the Mark-Phillip Trust and the State and Federal regulatory agencies, and a Consent Decree was filed in May, 1980 (USEPA, 1980). The Consent Decree required the Mark-Phillip Trust to undertake investigation and remedial work in exchange for the right to continue restricted development, thereby generating the revenue for the investigation and remedial work. However, the Mark-Phillip Trust did not comply with the Consent Decree.

5.3.4 Remediation

In December, 1980, the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) was passed by the U.S. Congress, which is commonly referred to as the "Superfund." The Act required USEPA to compile an inventory of hazardous waste sites which might require remediation. The Industri-Plex 128 Site in Woburn was on that National Priorities List.

In 1981, USEPA secured most of the undeveloped central and northern part of the Site between the MBTA railway and Interstate 93 with a chainlink fence. In May, 1982, Stauffer Chemical Company, a former land owner and potentially responsible party, voluntarily signed a Consent Order with the Massachusetts Department of Environmental Quality and Engineering and the USEPA. Stauffer Chemical Company consented to undertake a two-phased Remedial Investigation/Feasibility Study (RI/FS) of the Industri-Plex Site.

Stauffer Chemical Company completed their Phase I Remedial Investigation in April, 1983, their Phase II RI in August, 1984, and their FS in April, 1985 (Stauffer, 1983, 1984, 1985). The reports included an assessment of the environmental conditions at the Site, as well as evaluations and recommendations concerning remediation.

The Record of Decision (ROD) for the Industri-Plex Site was entered by the USEPA in September, 1986 based in part on the RI/FS prepared by Stauffer Chemical Company (USEPA, 1986a). The ROD included a Summary of Remedial Alternatives Selection and recommended remedial action for contaminated soils and sediments, air, and groundwater.

Another Consent Decree (for Remedial Design/Remedial Action) was subsequently entered in April, 1989 by the U.S. District Court, District of Massachusetts between the USEPA and the Commonwealth of Massachusetts as Plaintiffs, and 26 Settling Defendants (USEPA, 1989a). The Consent Decree included the Remedial Design/Action Plan (RDAP), and the requirements for establishing the Industri-Plex Site Remedial Trust (ISRT), the Industri-Plex Site Interim Custodial Trust and the Industri-Plex Site Escrow Agreement. The RDAP required the preparation of a Pre-Design Investigation Work Plan and a Remedial Design Work Plan.

In July, 1989, Golder Associates Inc. was retained by the ISRT to prepare the Pre-Design Investigation (PDI) and Remedial Design Work Plans, and execute the associated work. The Pre-Design Investigation Work Plan was approved by USEPA on January 24, 1990, and the PDI commenced in February, 1990.

The Remedial Design Work Plan was prepared by Golder Associates Inc. and was approved by USEPA on August 8, 1990 (Golder, 1990a). Preliminary stages of the design work had commenced previously in conjunction with the on-going PDI.

5.3.5 Landowners

The landowners on the Site as of February 7, 1991 are listed on Table 5-1 and their properties are identified on Sheet 5-1. The landowners include some of the Settlers under the Consent Decree and others who have subsequently acquired an interest.

5.4 EXISTING DEVELOPMENT

This section describes the existing Site development, the identified existing "in-service" utilities, and the currently identified abandoned facilities above and below grade. The existing development is shown on Sheet 5-2, the existing utilities are shown on Sheets 5-3A through 5-3D, and the abandoned facilities are shown on Sheets 5-4 and 5-5.

5.4.1 Transportation

The Industri-Plex Site is bounded on the east side by Interstate 93 (see Sheet 5-2). The MBTA railway, which runs in a roughly northwest-southeast direction, transects roughly the western third of the Site. There is currently no direct access across the MBTA railway between the east and west parts of the Site. The railway has two main tracks and a siding (the South Wilmington passing siding) on the west side. There are also two unused railway spurs on the east side of the MBTA railway near the north and south ends of the Site. The northern spur enters the Janpet Associates property (see Sheet 5-1). The southern spur (the Industrial Way side track) subsequently splits into three tracks to different warehouses near the south end of the Site. Part of this spur has been removed near the main MBTA railway so that it is no longer operable.

The east part of the Site is serviced by Commerce Way and Atlantic Avenue, which are asphalt paved streets. Commerce Way is accessible south of the Site via Mishawum Road and Interstate 95/State Route 128. The area west of the MBTA railway is serviced by New Boston and Merrimac Streets which are both paved. New Boston Street joins Mishawum Road south of the Site. Merrimac Street continues west of the Site to State Route 38.

Numerous dirt roads transect undeveloped parts of the Site, but most are not accessible to the general public.

5.4.2 Buildings

Seven separate commercial/light industrial buildings have been erected in the most recently developed part of the Site along Atlantic Avenue and Commerce Way east of the MBTA railway (see Sheet 5-2). There are eleven separate commercial/light industrial buildings west of the MBTA railway along New Boston Street and Merrimac Street within the Site boundary. The developments include paved parking lots for passenger vehicles and for heavy commercial vehicles, and landscaping including lawns, planters, trees and shrubs. Large boulders, presumably encountered in local excavations have been placed along some property lines, and are used extensively in landscaping. Similar commercial/light industrial development continues south of the Site.

5.4.3 Utilities

Identified in-service utilities below grade are shown on Sheets 5-3A through 5-3D. The utility locations were provided by the respective owners and, to the extent possible, from "as-built" drawings. However, the utility locations shown on the drawings should be regarded as approximate, and scaled dimensions taken from the drawings should not be used to locate utilities in the field. The drawings do not show utilities which are above grade. The locations of buried utilities inside the various property boundaries are not shown on the drawings. Field verification of all in-service utility locations prior to construction is essential because all utility locations may not have been shown on the drawings.

The discussion of utilities presented below is not intended to be a comprehensive inventory. Utility service lines to individual land owners are not always shown, and additional utilities installed by private contractors (such as lawn sprinkler systems) might also exist. On-site verification is therefore required to determine the status and locations of all utilities.

5.4.3.1 Utilities - Above Grade

Identified in-service utilities which are above grade consist of the following:

Owner	Utility
• Boston Edison Company	Electrical Power Transmission & Distribution System
• Massachusetts Bay Transportation Authority	Communications line in railway
• New England Telephone	Telephone System
• Continental Cablevision	Cable Television
• City of Woburn Fire Dept.	Fire Alarm.

The Boston Edison Company has two right-of-ways or easements within the Site. These carry transmission lines which are the sole source of electricity for North Woburn and for the Reading Municipal Light Department. Their facilities within Right-Of-Way No. 9 along the southwest side of the Site consist of two 115-KV transmission lines, two 13.8-KV distribution circuits, and one distribution circuit adjacent to the Right-Of-Way. Their facilities within Right-Of-Way No. 14 at the north side of the Site consist of two 115-KV transmission lines.

The Boston Edison Company also has a local distribution system on poles and in underground conduits along streets within the Site to supply electricity to local industrial consumers.

5.4.3.2 Utilities - Below Grade

Identified in-service utilities below grade are shown on Sheets 5-3A through 5-3D and consist of the following:

Owner	Utility
• City of Woburn	Water, Sanitary Sewer, Storm Sewer (Drain)
• Metropolitan District Commission	Sanitary Sewer
• Boston Edison Company	Electrical Distribution
• Boston Gas	Gas Distribution
• New England Telephone	Telephone System.

It is understood that the American Telephone and Telegraph Company (AT&T) was installing during Fall 1991 a fiber optic telephone conduit below grade inside the MBTA Right-of-Way.

The dimensions and material types for water mains, sewers and drains, where known, are also shown on Sheets 5-3A through 5-3D.

5.4.4 Abandoned Facilities

Approximate locations of identified abandoned facilities are shown on Sheets 5-4 and 5-5. These abandoned facilities were identified with the assistance of available maps and drawings, reports, and airphoto interpretation. Some facilities above grade were also identified by site inspection. Recent features resulting from current land use such as wood chip stockpiles and miscellaneous rubble and soil piles have also been shown on these drawings.

Abandoned facilities are those which are known or believed to be remnants of the previous chemical and animal glue manufacturing plants and which are understood to be no longer in service. Some of these abandoned facilities have since been partly or completely demolished and/or covered with debris or are in ruins. However, the extent of demolition of the chemical plant prior to construction of the animal glue manufacturing plant is unknown. The chemical plant facility was extensive and included land west of the MBTA railway as well as areas which are now the property of Janpet Associates, Chestnut Hill Realty, Atlantic Avenue Associates, Woburn Industrial Associates and the Industri-Plex Site Interim Custodial Trust. Therefore, there are probably abandoned facilities such as building foundations, floor slabs, underground utilities, storage tanks, etc., which may not have been demolished and have not been identified because they have since been covered with fill, debris and/or other materials. On-Site verification is therefore required to determine the status and locations of abandoned facilities.

The locations shown on the drawings are approximate and scaled distances should not be used to locate abandoned facilities in the field. Other unidentified abandoned facilities may exist which are not shown on the drawings. The most conspicuous abandoned facilities are described briefly in the following sections.

5.4.4.1 Abandoned Facilities - Above Grade

Identified abandoned facilities above grade include concrete floor slabs and foundations, tank foundations, ruins of buildings, open pits, etc., which are close to existing grade. The most conspicuous feature is the former powerhouse building and the adjacent stack beside the MBTA railway (see Sheet 5-4). Horizontal holes around the southern half of the stack circumference suggest that it was once prepared for demolition.

The bi-level concrete floor slab of the former animal glue manufacturing plant is about 750 feet long by 250 feet wide. This floor slab is presently occupied by trucking and wood recycling operations. Parts of an old railway spur leading to the slab are also visible. An open pit, which appears to contain a black oily substance, is situated near the northwest corner of the large concrete floor slab.

Concrete ruins and foundations are located near the northeast corner of the Chestnut Hill Realty property. Concrete foundation remnants are also located in the northwest and southwest corners of the Chestnut Hill Realty property.

The Arsenic Pit and two Chromium Lagoons are visible near the north and south ends of the Site, respectively. Ruins of the glue plant water supply filtration building, concrete tank foundations, pump house and related piping have been identified north and west of the Chromium Lagoons near the MBTA railway.

5.4.4.2 Abandoned Facilities - Below Grade

Identified possible abandoned facilities below grade, that were built for the former chemical and animal glue manufacturing plants and which might have been abandoned, are shown on Sheet 5-5. The locations of these facilities were obtained from various maps, drawings and reports (Janpet Associates, Inc., 1990; Goldberg-Zoino & Associates, Inc. [GZA], 1981, 1982a, 1982b, 1983; Southern Map Co., 1918; and USEPA, 1982), aerial photographs, and drawings provided by the City of Woburn and by Volpe Construction Co. (Janpet Associates, Inc., 1990). Municipal utilities in the streets, which may have been abandoned, are not included on Sheet 5-5.

Identified, potentially abandoned facilities below grade in the former plant area include buried utilities, underground storage tanks, and a concrete tunnel under the railway near the former powerhouse.

The buried utilities include water mains, process and waste water lines, sanitary sewer, storm sewer, and high voltage electrical conduits. Some of the manholes for buried utilities are still visible.

Information provided by Janpet Associates to the ISRT indicates that part of the old sanitary sewer system is still in operation (Janpet Associates, Inc., 1990). The other utilities have been abandoned and the potable water line has been replaced.

Janpet Associates also identified various underground storage tanks on their property. These tanks are reported to have capacities of 3,000 to 10,000 gallons.

Both ends of the concrete tunnel under the MBTA railway adjacent to the Janpet property are blocked. However, information obtained from the City of Woburn and from Volpe Construction Co. shows that the tunnel carried major plant utilities under the railway. These utilities consisted of thirteen drains, electrical conduits, gas mains, water mains, steam lines, and air lines ranging from 2 to 12 inches in diameter.

The map of the Merrimac Chemical Co. in 1918 (Southern Map Co., 1918) is believed to be a fire insurance map. It shows a water supply line in the plant area and also west of the MBTA railway (see Figure 5-3 and Sheet 5-5). This water line is presumed to be abandoned.

5.4.5 Industrial Wastes

The industrial wastes which were produced by chemical manufacturing between 1853 and 1934 are believed to have been disposed of over a large area which extended from the present Commerce Way to west of the MBTA railway. The wastes were probably used to fill low ground for plant expansion and also for construction of dikes to contain liquid wastes (USEPA, 1986a).

The wastes produced by manufacturing animal glue products were apparently disposed of in limited areas east and southeast of the plant. Large piles of hide residues and other wastes were produced by this disposal procedure (USEPA, 1986a).

Land development by the Mark-Phillip Trust proceeded northward onto the Site in the mid-1970's. The waste deposits from previous operations were apparently substantially removed from the areas to be developed. The excavated wastes were deposited adjacent to and encroaching onto Wetland 1C (see Sheet 5-6) near the north end of the Site. These relocated waste deposits have since been termed the East and West Hide Piles. The East-Central Hide Pile and the South Hide Pile are believed to be in their original locations but the original configuration has been modified by land development work. Excavated wastes were also piled along the Boston Edison Right-Of-Way No. 9.

The Arsenic Pit and the two Chromium Lagoons are additional specific areas where wastes are known to have been deposited. The Arsenic Pit is located on the south side of Wetland 1C at the north end of the Site, and the two Chromium Lagoons are located south of the former glue products plant, west of Atlantic Avenue and near the southern railway spur, and are identified as Wetlands 7A and 7B. Historical information indicates that these lagoons formerly extended further to the south than their present configuration.

5.5 PHYSIOGRAPHY

This section describes the Site topography, drainage, vegetation, and wetlands. The topography and drainage are shown on Sheets 11-1A through 11-1D and the wetlands are shown on Sheet 5-6.

5.5.1 Topography

The topography was provided by SAIC Engineering, Inc. (Lakeville, MA) using photogrammetric methods from aerial photographs taken in November, 1989 and February, 1990; and supplemented by ground-based measurements (SAIC Engineering Inc., 1990b, and LIU Aerial Surveys, Inc., 1989). The elevations are referred to the National Geodetic Vertical Datum of 1929 and the coordinate grid is based on the Massachusetts Coordinate System.

The ground surface across the Site slopes in a general southerly direction. The highest terrain and steepest slopes occur in a relatively small, undeveloped part of the Site along the northern boundary (see Sheets 11-1A through 11-1D). Most of the Site is at a lower elevation with relatively flat slopes. The flat part of the Site includes the area west of the MBTA railway; the former plant site and the developed area between the MBTA railway and Commerce Way; and most of the undeveloped area between Commerce Way and Interstate 93.

The ground surface elevation along the undeveloped north side of the Site varies from about 132 feet to 70 feet. This area includes the East and West Hide Piles. The East Hide Pile is higher than the West Hide Pile with the top at about 110 feet and about 40 feet of relief. The elevation of the top of the West Hide Pile is about 94 feet with about 24 feet of relief. Natural ground surface slopes range from about 1:1 to 5H:1V along the edge of the upland. The hide pile slopes range from about 1:1 to 6H:1V.

The elevation of the relatively flat part of the Site ranges from about 70 feet along the edge of the northern upland to about 56 feet at the south end of the Boston Edison Right-of-Way No. 9 for an overall average slope of about 0.4 percent.

Maximum elevations in the area west of the MBTA railway are about 93 feet on a dirt mound in the northwest corner of the Site, and 83 feet on the south embankment at the former New Boston Street/MBTA railway overpass. The general ground surface elevation to the north is 72 feet and the ground surface slopes downward to the south at approximately 0.5 to 2.0 percent. The lowest elevation of 59 feet occurs on the Boston Edison Right-of-Way No. 9 west of the MBTA railway.

The flat part of the Site between the MBTA railway and Commerce Way ranges in elevation from about 72 feet along the northern side to about 64 feet along the southern railway spur line. The overall average southward slope is about 0.4 to 1.2 percent. Higher elevations and steeper slopes occur on the East Central Hide Pile, the South Hide Pile, and at local bedrock outcrops. The East Central Hide Pile has about 28 feet of relief with the elevation of the top of the pile at 98 feet, and the slopes are about 2H:1V or flatter. The South Hide Pile has about 26 feet of relief with the elevation of the top of the pile at 93 feet, and slopes ranging from about 1:1 to 5H:1V.

The undeveloped area between Commerce Way and Interstate 93 slopes in a general southwesterly direction from Interstate 93 toward Commerce Way. The overall average slope is approximately 1.0 to 1.5 percent. Ground surface elevations range from about 76 feet in the south-central part of this area to about 66 feet at Commerce Way and about 60 feet along Phillips Pond. Local elevations up to about 88 feet occur along the east side near Interstate 93.

Bedrock outcrops are present in the northern upland and also in the relatively flat part of the Site. The locations of these outcrops are described in Section 5.7, Physical Subsurface Conditions.

5.5.2 Drainage

Site drainage is to the south into two streams, the Aberjona River and its tributary Halls Brook. The headwaters of both streams are outside of the Site boundary. The Aberjona River flows through the Site and into Upper Mystic Lake, which is about 5 miles south of the Site.

Major changes have occurred along the Aberjona River and Mishawum Lake in order to facilitate land development (USGS, 1979 and 1985). Prior to land development, the Northern Branch of the Aberjona River flowed southward from the north end of the present Commerce Way, across the Boston Edison Right-of-Way No. 9, roughly midway between Commerce Avenue and the MBTA railway and into the former Mishawum Lake (see Figure 5-1). The Southern Branch of the Aberjona River joined the Northern Branch west of Commerce Way and north of the Boston Edison Right-of-Way No. 9. The former Mishawum Lake occupied most of the area bounded by Mishawum Road, the MBTA railway, the Boston Edison Right-of-Way No. 9 and Commerce Way. Most of this drainage system was filled and relocated during Site grading for land development.

The Aberjona River and Halls Brook have a total watershed area of about 6.4 square miles upstream of Mishawum Road. Excluding Halls Brook and the Holding Area, the Aberjona drainage area upstream of Mishawum Road is about 4 square miles. It is estimated that the 100-year, 24-hour storm event would produce a discharge of about 471 cubic feet per second (cfs) at the confluence of the Northern and Southern Branches of the Aberjona River (see Chapter 10). The minimum discharge in August, 1990 is estimated to be about 4 cfs or less (Roux, 1991a).

The undeveloped north end and east side of the Site are currently drained by the Northern and Southern Branches of the Aberjona River. The Northern Branch enters the northeast corner of the Site through Interstate 93 and flows in a southwesterly direction to the north end of Commerce Way. Several wetlands along the east side of the Site between Commerce Way and Interstate 93 are in the Aberjona River watershed (Wetlands Management Specialists, Inc. [WMS], 1986). The wetland between the East and West Hide Piles near the north edge of the Site drains through the Western Branch of the Aberjona River (Wetland 2A), that in turn discharges into the Aberjona River (Wetland 2B) through a culvert at the extension of Commerce Way.

The Aberjona River then flows southward along Commerce Way in a median ditch and culverts to about 300 feet south of the Site boundary. At this point it joins the Southern Branch of the river. The Southern Branch flows westward from Interstate 93 through Phillips Pond which drains through a ditch to Commerce Way. Phillips Pond is believed to have been constructed, or at least expanded, to form a holding area for flood management purposes.

From the confluence of the two branches, the Aberjona River flows southward through the median ditch and culverts on Commerce Way. About 900 feet south of the Boston Edison Right-of-Way No. 9, the river flows westward in a drainage ditch to a dike bordering the east side of Halls Brook Holding Area. The river then flows southward parallel to the Halls Brook Holding Area to the culvert at Mishawum Road. At this culvert, the discharge from the Halls Brook Holding Area combines with flow from the Aberjona River and continues southward as the Aberjona River.

Halls Brook is located southwest of the Site and about 400 feet south of the Boston Edison Right-of-Way No. 9. The Site area west of the MBTA railway drains southward into Halls Brook which flows eastward beneath the MBTA railway into the man-made Halls Brook Holding Area.

In the northwest corner of the Site, the New Boston Street Drainway carries drainage southward to about 400 feet north of Merrimac Street. At this point, the New Boston Street Drainway is joined by an eastward-flowing drainage ditch. The combined discharge then enters a drain system which flows through a culvert southward under New Boston Street and close to the MBTA railway where it discharges on the Boston Edison Right-of-Way No. 9 near Wetland 8. The drainage continues southward along the west side of MBTA railway and into Halls Brook.

The Halls Brook Holding Area also receives Site drainage from the Atlantic Avenue Drainway. This drainage ditch begins at Atlantic Avenue, flows southward between the Chromium Lagoons and the South Hide Pile, beneath the southern railway spur (the Industrial Way side track) and crosses the Boston Edison Right-of-Way No. 9 and enters the north end of the Holding Area. The Halls Brook Holding Area extends about 3/4 mile south of the Site where it discharges into the Aberjona River at Mishawum Road.

5.5.3 Vegetation

The most extensive vegetation occurs along the undeveloped north and east sides of the Site (see Sheet 5-2). Excluding the wetlands, the vegetation typically consists of dense maple, aspen, cottonwood and oak trees with trunk diameters ranging from 4 to 24 inches, together with shrub undergrowth. Dense, tall reeds (phragmites) grow on the hide piles and around the wetlands including the Chromium Lagoons. Purple loosestrife, cattails and shrubs also grow in the wetlands (WMS, 1986 and Normandeau Associates Inc., 1990).

5.5.4 Wetlands

The wetlands were delineated by Wetland Management Specialists, Inc. for Roux Associates, Inc. as part of the RI/FS (WMS, 1986). In the WMS (1986) report, the wetlands locations are shown on Figure 1 and delineation of each wetland is shown on Figures 2 through 7. Based on these figures, the wetlands within the Site boundary are shown on Sheet 5-6.

The Site wetlands range in size from less than 1/2 acre to more than 6 acres, for a total of about 19 acres. Some of these wetlands are comprised of two or more smaller contiguous areas. Wetland areas include the area between the East and West Hide Piles, and the Chromium Lagoons.

5.6 SITE INVESTIGATIONS

Previous Site investigations were conducted with a variety of objectives. USEPA and the Massachusetts Department of Environmental Quality and Engineering both prepared hazardous waste inspection reports in the period from June, 1979 to September, 1980. USEPA also had topographic maps prepared by photogrammetric methods (USEPA, 1982). Fred C. Hart Associates, Inc. (1980) prepared a plan for the investigation of hazardous waste problems in Woburn. Ecology and Environment, Inc. (1980, 1981a, 1981b, 1981c, 1982) prepared several reports dealing with metal content in airborne dust from the Mark-Phillip Trust property, as well as the geology, groundwater, and existing well data from East and North Woburn. Environmental Research and Technology, Inc. (1985) prepared a report on safe levels of arsenic, chromium and lead in soils at the Industri-Plex Site in July, 1985. GZA conducted investigations for site-specific purposes (e.g., GZA, 1981, 1982a, 1982b and 1983). The most comprehensive previous investigation is the RI/FS prepared by Stauffer (1983, 1984 and 1985).

More recent investigation work has been conducted under the PDI, the Remedial Design, and the Ground-Water/Surface-Water Investigation Plan Remedial Investigation (GSIP/RI). The PDI commenced in February, 1990 and was conducted by Golder Associates Inc. along with several subconsultants for the ISRT. The Remedial Design was initiated shortly thereafter and was performed by Golder Associates Inc. and several subconsultants. The Phase I GSIP RI was initiated in March, 1990 by Roux Associates, Inc. in conjunction with other subconsultants for the ISRT. The Phase I GSIP RI was completed in June, 1991 (Roux, 1991a). A Phase II GSIP RI, and a GSIP Feasibility Study (GSIP/FS) are currently being performed. The Phase II GSIP RI is currently scheduled to be complete by the summer of 1992. Additional groundwater treatability studies are also being performed at this time to evaluate the feasibility of designing a fluidized bed biological groundwater treatment system (The Advent Group, Inc., 1991).

5.6.1 Remedial Investigation/Feasibility Study

Stauffer Chemical Company conducted an RI/FS of the Site as required by the Consent Order of May, 1982. The RI/FS was conducted in two phases. The objective of the Phase I RI, which dealt with the entire Industri-Plex Site (as it was defined at the time), was to determine the type and location of the waste deposits and to assess their impact on surface water, groundwater and air. The Phase I RI report was completed in April, 1983. The objective of the Phase II RI was to obtain more detail for the areas containing waste deposits identified in Phase I, and the FS was to recommend remedial actions for soil/waste deposits, groundwater and air. The Phase II RI report was completed in August, 1984, and the FS was completed in April, 1985 (Stauffer, 1984 and 1985).

The field and laboratory programs for the Phase I and Phase II RI/FS are summarized in Tables 5-2 and 5-3. The RI/FS subsurface investigation included a total of 1049 soil and sediment borings/test pits, 87 groundwater wells (including temporary and pump test wells) and 31 piezometers. Some of the above work was carried out in areas which are outside of the present Site boundary. A total of 1458 soil samples, 110 groundwater samples and 119 air samples were recovered for subsequent analytical testing. The RI/FS borehole and test pit locations which are within the present Site boundary are included on Sheets 11-2A through 11-2D.

The results and conclusions of the RI/FS included the following (Stauffer, 1985, pp 2-3):

> "...no waste deposits or soil contamination were found on the 120 acres East of Commerce Way. About 50 acres of soil contaminated with heavy metals and 20 acres of hide waste piles and burials were located on the 124 acres West of Commerce Way and in the northwest corner of the Site. From the findings of the investigation and subsequent environmental impact and endangerment assessments, the Site problems were identified as follows:
>
> o Groundwater contaminated with parts per million (ppm) levels of benzene and toluene that has the potential to migrate to the closed Woburn municipal drinking wells and exceed EPA's Suggested No Adverse Response Level (SNARL), recommended by the National Academy of Sciences (NAS), for benzene at this point.
>
> o Odors caused by emissions of hydrogen sulfide (H_2S) gas generated by the anaerobic bacterial degradation of the East Hide Pile.
>
> o Potential direct human contact exposure to levels of arsenic (As), lead (Pb), and chromium (Cr), in the near surface soil, greater than the calculated safe levels (Appendix F)...."

These RI/FS conclusions are described in more detail by environmental media in Sections 5.6.1.1 through 5.6.1.3 below.

5.6.1.1 Soil and Waste Deposits

The RI/FS concluded that the waste deposits were generally buried to a depth of 8 to 10 feet below grade and the area where soil contains heavy metals is generally located between the MBTA railway and Commerce Way, and from the Chromium Lagoons/South Hide Pile vicinity to the crest of the upland along the north boundary of the Site. Heavy metals were also said to be present in land along New Boston Street, Merrimac Street, and between New Boston Street and the MBTA railway on the southwest side of the

Site. Zinc was found to be the most widespread metal. Chromium was generally found along with hide residues. About 25 acres contained chromium concentrations of 100 ppm or more, and 18 of the 25 acres contained chromium concentrations of more than 1,000 ppm. Lead was usually found in combination with arsenic. About 57 acres contained arsenic and/or lead concentrations of more than 100 ppm, and 29 acres had concentrations of more than 1,000 ppm of one or both metals. In the former Arsenic Pit (11 acres) and the Chromium Lagoons (9.5 acres), metals were present in the upper 2 feet at concentrations greater than 100 ppm. It was also concluded that there was no evidence of significant leaching of heavy metals from the waste deposits into the groundwater directly below the waste deposits. No waste deposits of benzene, toluene or other organic compounds were found. Concentrations for organic compounds were generally at low levels. Hide residues were found in four distinct areas as follows:

Hide Pile	Area	Volume
East Hide Pile	3.2 acres	125,000 cu. yds.
West Hide Pile	2.6 acres	50,000 cu. yds.
East Central Hide Pile	5.7 acres	106,000 cu. yds.
South Hide Pile	1.4 acres	60,000 cu. yds.
Totals	12.9 acres	341,000 cu. yds.

"Buried hides" were also found along the Boston Edison Right-of-Way No. 9.

5.6.1.2 Groundwater

The RI/FS concluded that groundwater flows in a general north to south direction in buried geologic valleys beneath the Site. On-Site precipitation is considered to be the most important source of groundwater recharge. The rate of groundwater flow downgradient of the Site was estimated to be approximately 1 foot per day or less. Shallow groundwater patterns were considered to be complex due to the variability in geologic conditions (subsurface bedrock, ledges, and ridges) topography and permeability. No domestic wells were identified by Stauffer downgradient between the Site and the City of Woburn closed wells G and H. No detectable levels of lead, arsenic and cadmium were found in the Phase II RI/FS after resampling the Phase I wells which initially showed 120 parts per billion (ppb) lead, 120 ppb arsenic and 28 ppb cadmium. No hexavalent chromium was detected in any groundwater samples. Arsenic, lead and zinc were found in a few downgradient monitoring wells at levels in excess of drinking water standards. The RI/FS concluded that significant leaching of heavy metals had not occurred and that there was no identifiable plume of heavy metals. However, benzene and toluene concentrations up to 32,000 ppb were found in groundwater. Immediately downgradient of the Site, benzene concentrations up to 747 ppb and toluene concentrations up to 177 ppb were found indicating that a plume of these organic compounds was present.

5.6.1.3 Air

The RI/FS identified the four hide piles as potential sources of volatile emissions and odor. The East Hide Pile was determined to be the predominant odor source and contained soil gas with hydrogen sulfide concentrations ranging from 5,600 ppm to 21,000 ppm, and mercaptans up to 400 ppm. Gas emission rates up to 1.25 standard cubic feet per minute (scfm) were measured. The West Hide pile had much lower hydrogen sulfide concentrations and measured gas emission rates (about 250 ppm and of 0.7 scfm, respectively). No gas emission rates could be measured at the East Central and South Hide Piles, although localized odors were observed at uncovered areas in the East Central

Hide Pile. The RI/FS also concluded that odors and gas emissions were influenced by changes in barometric pressure. Total gas emissions from the entire East and West Hide Piles were estimated at 1.82 scfm and 0.64 scfm, respectively.

5.6.2 Pre-Design Investigation

The PDI was conducted to obtain additional data required for design of the remediation for Soil and Sediment, Groundwater, and Air, as required by the Consent Decree and the RDAP. The field program for the PDI commenced in February, 1990.

The Pre-Design Work Plan was developed after a review of existing data to identify those areas where additional data were required to support design and implementation of the remedial actions specified in the Consent Decree. The PDI tasks, classified by environmental media, are as follows (Golder, 1989):

a) Soil Remediation

Task S-1	Determine Extent of Hazardous Substances in Soils
Task S-2	Stability of Hide Piles
Task S-3	Identify Sources of Cap Materials
Task S-4	Foundation Data

b) Groundwater Remediation

Task GW-1	Plume Delineation
Task GW-2	Hydrogeologic Characterization for Extraction/Recharge System
Task GW-3	Groundwater Treatability

c) Surface Water/Sediments Remediation

Task SW-1	Extent of Hazardous Substances in Wetlands and Surface Water Sediments
Task SW-2	Surface Water Treatability
Task SW-3	Wetlands Evaluation

d) Air Remediation

Task A-1 Baseline Air Survey
Task A-2 Gas Treatability.

The Pre-Design Work Plan included tasks for developing a site monitoring plan and for surveying. It also included a Project Operation Plan (POP) which consisted of the Field Sampling Plan (FSP), the Quality Assurance Project Plan (QAPjP), and the Health and Safety Plans. The FSP described the procedures which were used for sample collection and analysis. The QAPjP described those aspects of sample collection and analysis which are relevant to data quality assurance/quality control (QA/QC) and presented data acceptance criteria. The Health and Safety Plan presented policies and procedures to assure safe work practices and identified potential hazards to the field team during the investigation. Additional work plans were prepared for specific PDI groundwater tasks (Golder, 1990b, 1990c, 1990d, 1990e, 1991a, 1991b; The Advent Group, Inc., 1991).

Field and laboratory programs for the PDI activities are summarized by respective tasks in Tables 5-4 and 5-5. The subsurface investigation for the PDI tasks included a total of 492 soil borings or test pits, and 62 groundwater monitoring wells and piezometers, some of which were temporary. The on-Site borehole, test pit and monitoring well locations are shown on Sheets 11-2A through 11-2D. A total of 1,145 soil samples, 66 groundwater samples, and 54 air samples were collected for geotechnical and chemical testing, excluding quality assurance/quality control samples.

The information obtained from the PDI is summarized in Sections 5.7 through 5.10 This information is used in the Remedial Designs for Soil and Sediment, Groundwater, and Air.

5.6.3 Ground-Water/Surface-Water Investigation Plan

The Phase I GSIP RI was initiated in February, 1990 for the ISRT by Roux Associates, Inc. and subconsultants, and was completed in June, 1991 (Roux, 1991a). The Phase II GSIP RI is being performed by Roux Associates and subconsultants for the ISRT.

The Phase I GSIP RI study area included the ISRT Site as well as contiguous areas. The objectives of the Phase I GSIP RI were as follows:

- Define the groundwater, surface-water and sediment quality entering the Site;
- Define the groundwater, surface-water and sediment quality leaving the Site;
- Determine the potential impacts on downgradient water use based on the results of the above objectives; and,
- Determine if metals could become mobile in the future and, if so, what risk they represent to human health and the environment, including aquatic organisms and consumers of aquatic organisms.

Information from the Phase I GSIP RI report was used as additional input for the Remedial Design. The Phase I GSIP RI report (Roux, 1991a) should be consulted for further information and details. The Phase II GSIP RI (Roux, 1991b) will also collect additional on-Site data for groundwater, but these data are not available at this time.

5.7 PHYSICAL SUBSURFACE CONDITIONS

The general geology, geotechnical soil conditions, and groundwater depths, as they relate to remedial design, are described in the following sections. These descriptions are based on data and information presented in the RI/FS, the PDI, and the Phase I GSIP RI. These reports should be consulted for further information. Detailed descriptions of Site geology and hydrogeology as related to the design of the groundwater extraction system are provided in Chapter 6.

5.7.1 Geology

A detailed description of the Site geology is presented in Chapter 6. The general stratigraphy at the Site, in ascending sequence, is presented below.

Bedrock

The local bedrock consists of igneous rocks (gabbro and granodiorite) that have locally undergone metamorphism and structural deformations to form their metamorphic equivalents. The upper part of the bedrock is fractured and becomes more competent with depth. Differential weathering and erosion of the weaker rocks along faults produced preglacial valleys in the top of bedrock.

Glacial Till

The bedrock is overlain by Glacial Till in parts of the Site. The Glacial Till is discontinuous and the contact between the till and the bedrock is expected to be irregular. The till is often thin or absent near the center of the preglacial valleys where it may have been removed by erosion. The till thickness generally increases toward the sides of the preglacial valleys. The maximum till thickness of about 32 feet was encountered in Borehole RB18 near the Aberjona River in the northeast part of the

Site. Glacial Till is stripped from the surface of some bedrock ridges.

The Glacial Till is typically an unsorted, poorly-graded, coarse-textured mixture of particles ranging in size from clay to boulders.

Proglacial Deposits

The proglacial deposits consist of alluvial and/or lacustrine sediments interbedded with outwash deposits. Lacustrine and alluvial clay with some interbedded sand and gravel was deposited in ponded water or marine embayments. This was followed by deposition of Outwash Sand from braided streams during glacial retreat. Further alluvial or lacustrine sediments were deposited during the final glacial retreat.

The stratified drift (Outwash Sand) consists mainly of well to poorly sorted sand and gravel with interbedded boulders, cobbles, silt and clay, which have partially filled the preglacial valleys. The proglacial deposits are thin or absent where bedrock is close to the surface along the sides of the preglacial valleys. The thickness increases to a maximum of about 70 feet toward the center of the preglacial valleys and in a southerly direction from the Site toward Mishawum Road.

The Outwash Sand forms the predominant portion of the unconfined (water table) aquifer at the Site. In general, the Outwash Sand thickness decreases in the north, and in the east and west parts of the Site where bedrock is closer to ground surface. The thickest part of the Outwash Sand occurs along the axis of the preglacial valleys.

Postglacial Deposits

The postglacial or recent deposits consist of sand and silt which is interbedded with gravel, organic matter (including peat) and silt. The postglacial deposits occur in topographic low areas occupied by streams and wetlands.

Fill occurs over much of the Site west of Commerce Way. The fill consists of silty sands, demolition debris, and chemical manufacturing wastes including animal hide residue.

5.7.2 Soil Conditions

This section summarizes the results of site-specific geotechnical investigations which were conducted during the PDI for the following tasks:

Task S-2 Stability of the Hide Piles
Task S-4 Foundation Data.

The purpose of PDI Task S-2 was to provide the stratigraphy and geotechnical parameters required to assess the current slope stability of the East and West Hide Piles, and to propose appropriate stabilization measures.

The purpose of PDI Task S-4 was to provide the geotechnical characteristics for potential locations of the groundwater and gas treatment plants, and also for future Site development.

The Interim Final Reports for PDI Tasks S-2 and S-4 should be consulted for further Site geotechnical information.

5.7.2.1 Field and Laboratory Programs

Field Programs

The field program for PDI Task S-2 at the East and West Hide Piles was conducted between April 16 and May 29, 1990. The field program is summarized on Table 5-6 and the borehole locations are shown on Sheet 5-7. A total of 17 boreholes were drilled and sampled using a hollow stem auger drill rig. Eight borings were drilled at the West Hide Pile and nine borings at the East Hide Pile. The boreholes ranged from 8.4 feet to 40.5 feet in depth for a total of 377.4 feet drilled. Shelby tube, Standard Penetration Test, and bulk samples were recovered from the boreholes. Borehole Nos. 6 and 14 were completed as groundwater monitoring wells OW-31 and OW-32, respectively. The remainder of the boreholes were backfilled with cuttings.

The field program for PDI Task S-4, Foundation Data, was conducted from April through June, 1990, and March, 1991. The field program is summarized on Table 5-6 and the borehole and test pit locations are shown on Sheets 11-2A through 11-2D. A total of 13 boreholes were drilled and sampled using a hollow stem auger drill rig. A total of 22 test pits were excavated and sampled using a track-mounted backhoe. The 22 test pits include 3 test pits where a second test pit was excavated nearby because hide residue and/or refusal was encountered. The second test pit numbers are designated with the post-script "A."

Nine of the boreholes for PDI Task S-4 were drilled at three potential groundwater or gas treatment plant locations (Boreholes T1 to T9), and the other four boreholes were drilled east of Commerce Way (Boreholes SD1 to SD4). The boreholes ranged from 3.5 to 42.1 feet in depth for a total of 298.1 feet drilled. Standard

Penetration Test samples were recovered from the boreholes, which were backfilled with drill cuttings. The upper ten feet of bedrock was cored from each borehole at locations T5 through T9.

Twelve of the test pits for PDI Task S-4 were excavated in the three potential groundwater or gas treatment plant locations (Test Pits P1 to P10), and the other 10 test pits were excavated east of Commerce Way (Test Pits P11 to P19). The test pits ranged from 0.8 feet to 8.0 feet in depth. Bulk samples were recovered from the test pits, which were backfilled with the excavated soils.

Further information concerning the field programs and the borehole and test pit logs is provided in the relevant reports (Golder, 1990g and 1990h).

Laboratory Programs

Samples recovered from the PDI Tasks S-2 and S-4 field programs were returned to Golder Associates Inc. Geotechnical Laboratory in Mt. Laurel, N.J., and were selectively tested for index and engineering properties. The laboratory testing programs are summarized on Table 5-7. Further information concerning the laboratory testing programs and protocols is provided in the relevant reports (Golder 1990g and 1990h). The laboratory test results are summarized on Tables 5-8 and 5-9.

5.7.2.2 Stratigraphy

The following strata, in descending order, were identified in the PDI Task S-2 and S-4 investigations and inferred from the descriptions in the RI/FS boreholes.

Surficial Materials

Undifferentiated and variable Surficial Materials are generally considered to be fill materials. Along the margins of wetlands, some of the soils identified as surficial materials may be of natural origin. Other terms used in the logs to describe Surficial Materials include "overburden" and "waste". This includes waste from former chemical manufacturing operations, and demolition debris.

Fill and Hide Residue

Fill and Hide Residue is a mixture of hide residue and natural soil which was placed in the East and West Hide Piles. Fill and Hide Residue is distinguished from Surficial Material by the presence of hair. The hide residue from the animal glue manufacturing process was originally deposited in the area of the East Central and South Hide Piles together with other solids and sludge. During Site grading for land development, these wastes were excavated, hauled and deposited in the two piles which are known as the East and West Hide Piles. The waste materials were probably mixed with natural soils as a consequence of this operation and therefore the term "Fill and Hide Residue" is used to reflect the origin and composition of the East and West Hide Pile materials.

Outwash Sand

Outwash Sand is an undisturbed natural deposit of proglacial origin which is visually distinguished from the overlying Fill and Hide Residue by its texture, color, and absence of hair.

The proglacial deposits described in Section 5.7.1, Geology, are referred to collectively as Outwash Sand for geotechnical purposes.

In some of the RI/FS boreholes, a stratum which was described as "peat" was encountered at the top of the Outwash Sand. However, the sample descriptions from the S-2 and S-4 investigations indicate that this material contains soil constituents as well as organic matter. It is considered that this material was the original topsoil which was left in place when Fill and Hide Residue were placed over it. For geotechnical purposes, the classification of "peat" does not appear to be appropriate and therefore this material has been reclassified as organic soil. However, peat was identified in other areas of the Site between the Outwash Sand and fill.

Glacial Till

Glacial Till is an undisturbed natural deposit of glacial origin which is visually distinguished from the overlying Outwash Sand by gradation, color, and density.

The geotechnical characteristics of these stratigraphic units are described in Sections 5.7.2.3 to 5.7.2.6, and selected geotechnical cross-sections at the East and West Hide Piles are shown on Sheets 5-7 and 5-8. The groundwater conditions are discussed in Section 5.7.3. Geotechnical laboratory test results are presented in Tables 5-8 and 5-9.

5.7.2.3 East and West Hide Piles

Surficial Material

The Surficial Materials on the East and West Hide Piles generally consist of relatively uniform, loose to very loose SILT and fine to coarse SAND with a trace of CLAY. Coarser textured samples contain a little fine GRAVEL. Finer textured samples consist of SILT with some fine to medium SAND. Plasticity test results indicate the Surficial Materials to be non-plastic (see Table 5-8). The presence of organic matter is shown by organic content test results of 7.0 and 8.1 percent on two samples tested. The Surficial Material is classified as SM or ML under the Unified Soil Classification System (USCS).

Surficial Material was encountered less frequently around the East Hide Pile and was coarser-textured (SM). Only one of the nine PDI boreholes on the East Hide Pile (Borehole 12 on top of the East Hide Pile - see Sheets 5-7 and 5-8) contained Surficial Material with a thickness of 2.5 feet. Surficial Material, 4.0 to 7.5 feet in thickness, was encountered in six of the eight PDI boreholes at the West Hide Pile, and was absent in Boreholes 3 and 6.

Results from a consolidated-undrained triaxial shear strength test with pore pressure measurement indicates the following effective shear strength parameters for the Surficial Material:

Effective cohesion	1 psi
Effective angle of shearing resistance	30 deg.

However, the Surficial Material is basically a non-plastic silt and fine sand, which is expected to behave as a cohesionless soil in terms of effective stresses. Standard Penetration Test 'N' values range of 1 to 14 blows per foot. Based on the work of Schmertmann (1975), an effective angle of shearing resistance of 25 degrees was estimated. The more conservative value of 25 degrees with zero cohesion was recommended for remedial design purposes (Golder, 1990g). A typical saturated unit weight of 100 pounds per cubic foot (pcf) was also recommended for the Surficial Material.

The typically loose condition of this Surficial Material is indicative of a relatively high compressibility. Based on the work of Nishida (1956), a compression index (C_c) of 0.5 was estimated.

The engineering properties of the Surficial Materials, recommended for use in design, are summarized as follows (Golder, 1990g):

Unit Weight (saturated)	100 pcf
Effective Shear Strength Parameters:	
- Angle of shear resistance	25 degrees
- Cohesion	zero
Compression Index	0.5

Fill and Hide Residue

The Fill and Hide Residue at the East and West Hide Piles generally consisted of loose to compact, silty, fine to coarse SAND with a little to some fine GRAVEL, a trace of CLAY, and variable amounts of organic matter and hair. Occasional cobbles and wood fragments were also present in this heterogeneous material. Plasticity tests indicate that the Fill and Hide Residue is typically non-plastic (see Table 5-8). Test results for organic content range from 0.6 to 19.1 percent. The Fill and Hide Residue is classified as SM or SP-SM under the USCS. The general similarity between the grain size distributions for the Fill and Hide Residue and the Outwash Sand suggests that the Outwash Sand was the source for the soil component in the Fill and Hide Residue.

Fill and Hide Residue ranging from 10.0 to 38.5 feet in thickness was encountered in six of the nine PDI boreholes at the East Hide Pile (see Sheets 5-7 and 5-8). Fill and Hide Residue was absent in Boreholes 14, 16 and 17 along the south side of this hide pile. At the West Hide Pile, Fill and Hide Residue ranging from 5.0 to 18.7 feet in thickness was encountered in four of the eight PDI boreholes. Fill and Hide Residue was absent in Boreholes 4, 5, 7 and 8 on the West Hide Pile.

Wet unit weights determined from Shelby tube samples of Fill and Hide Residue range from 65 to 130 pcf (see Table 5-8). Natural water contents of these samples vary from 14.4 to 36.2 percent, with corresponding dry unit weights of 49.5 to 108.2 pcf. The wide range of water content and density values was considered to be partly due to the varying degree of saturation probably resulting from perched water tables within the hide piles. A conservative value of 125 pcf was recommended for design in order to allow for possible saturation under future field conditions (Golder, 1990g).

Triaxial shear strength tests were conducted on undisturbed Shelby tube samples and on samples remolded to field density and water content. Consolidated-drained tests and consolidated-undrained tests with porewater pressure measurement were performed. The shear strength parameters were also estimated from the Standard Penetration Test (SPT) 'N' values using the work of Schmertmann (1975). The SPT 'N' values typically ranged from 3 to 11 blows per foot near the top of the Fill and Hide Residue, and increased with depth to 10 to 36 blows per foot at about 30 foot depth. The shear strength parameters estimated from the triaxial test results and from the SPT 'N' values were as follows:

	Triaxial Tests	SPT 'N' Values
Effective Cohesion	2 psi	0
Effective Angle of Shearing Resistance	37 deg.	35 deg.

An effective angle of shearing resistance of 34 degrees with zero cohesion was recommended for design purposes for the Fill and Hide Residue (Golder, 1990g).

The results of one-dimensional consolidation tests on samples of the Fill and Hide Residue indicated a compression index (C_c) ranging from 0.07 to 0.34. A compression index value of 0.3 was recommended for design purposes (Golder, 1990g).

The engineering properties of the Fill and Hide Residue, recommended for use in design, are summarized as follows (Golder, 1990g):

Unit Weight (saturated)	125 pcf
Effective Shear Strength Parameters:	
- Angle of shear resistance	34 degrees
- Cohesion	zero
Compression Index	0.3

Outwash Sand

The Outwash Sand at the East and West Hide Piles generally consists of compact to dense, uniform, fine to medium SAND with little SILT. The Outwash Sand is typically non-plastic. Test results indicated organic contents ranging from 0.8 to 8.1 percent (see Table 5-8). The Outwash Sand was classified as SM or SP-SM under the USCS.

In some of the RI/FS boreholes, a layer approximately 1 foot thick and designated as "peat" was recorded between the Outwash Sand and the overlying Fill and Hide Residue. The descriptions indicate that this material was a variable clayey sand which contained root matter. It is considered that this material was probably the original organic topsoil which was left in place when the Fill and Hide Residue was deposited. For engineering purposes, this laterally discontinuous layer has been reclassified as "organic clayey sand" and is not described separately.

In the East Hide Pile, Outwash Sand thicknesses of 0.7 to 13.0 feet were encountered in the four boreholes which penetrated through this stratum. The remaining five boreholes penetrated 0.4 to 7.0 feet at termination in the Outwash Sand. Borehole 12 was terminated by auger refusal after penetrating 0.4 feet into the Outwash Sand.

In the West Hide Pile, Outwash Sand thicknesses of 5.0 and 6.0 feet were encountered in Boreholes 3 and 7 which penetrated through this stratum. The remaining six boreholes penetrated 4.4 to 8.3 feet at termination in the sand. Borehole 8 was terminated by auger refusal after penetrating 4.4 feet into the Outwash Sand.

SPT 'N' values for the Outwash Sand typically ranged from 10 to 40 blows per foot, indicating a compact to dense condition.

The engineering properties of the Outwash Sand, recommended for use in design, are summarized as follows (Golder, 1990g):

Unit Weight (saturated)	120 pcf
Effective Shear Strength Parameters:	
- Angle of shearing resistance	36 deg.
- Cohesion	Zero

Glacial Till

The Glacial Till at the East and West Hide Piles generally consist of dense to very dense, broadly-graded, fine to coarse SAND with some GRAVEL, little SILT and a trace of CLAY. The till is non-plastic and is classified as SW or SM under the USCS. SPT 'N' values in the Glacial Till ranged from 31 to more than 100 blows per foot indicating a dense to very dense condition.

It is noted that the grain size distribution test results were based on samples recovered from the Standard Penetration Test split spoon which has an inside diameter of 1.375 inches. The maximum particle size recovered by the sampler is therefore expected to be smaller than the maximum particle size of the Glacial Till "in situ". The till is expected to contain coarse gravel, cobbles and boulders, and these coarse materials probably contributed to the high SPT 'N' values.

Boreholes 14, 16 and 17 at the East Hide Pile penetrated 2.3 to 5.0 feet into the till stratum. No Glacial Till was recorded in Borehole 13 where the Outwash Sand was underlain by bedrock. Borehole 14 was terminated by auger refusal after penetrating 2.3 feet into the till. Boreholes 3 and 7 at the West Hide Pile penetrated 3.2 and 4.5 feet into the Glacial Till, and were terminated without auger refusal.

The engineering properties of the Glacial Till, recommended for use in design, are summarized as follows (Golder, 1990g):

Unit Weight	125 pcf
Effective Shear Strength Parameters:	
- Angle of shearing resistance	37 deg.
- Cohesion	Zero

<u>Bedrock</u>

Borehole 13 was the only PDI Task S-2 borehole drilled to bedrock at the East and West Hide Piles. This borehole penetrated 0.8 feet into weathered bedrock.

5.7.2.4 Potential Treatment Plant by West Hide Pile

A potential treatment plant location was investigated adjacent to and south of the West Hide Pile. Borehole and test pit locations are shown on Sheet 5-7. The stratigraphy, in descending order, consists of Surficial Material, Outwash Sand and Glacial Till.

Surficial Material

The Surficial Material was classified as "fill" on the PDI borehole and test pit logs, and as "waste" on the RI/FS borehole logs.

Two different types of fill were identified in the boreholes and test pits. The first type is a predominantly gravel and sand fill, with bricks and clay; and the second type is a multi-colored predominantly sandy silt to sandy clay. The gravel and sand fill with bricks and clay was encountered in thicknesses up to 6.5 feet in Borehole 7 and in Test Pits P5, P6 and P8. SPT 'N' values of 10 and 14 blows per foot recorded in Borehole 7 indicate that this fill is in a compact condition. Index test results for a sample of this fill indicate that it is a coarse to fine GRAVEL with some SAND and non-plastic SILT which was classified as GM under the USCS (see Table 5-9).

The multi-colored sandy silt to sandy clay fill was encountered in thicknesses of up to 5.5 feet in Boreholes 8, T3, 47/31, 48/32 and 48/34, and also in Test Pits P7 and P8. The multiple colors of this fill ranged from beige to maroon to reddish brown. SPT 'N' values of 2 blows per foot indicate that this fill is in a very loose or very soft condition. The fill thicknesses in the boreholes range from 4.0 to 7.5 feet. The test pits did not penetrate to the bottom of the fill due to the high groundwater table. Index test results indicate that it consists of SAND and SILT with little fine GRAVEL, giving a USCS classification of SM or ML (see Table 5-9).

Outwash Sand

The fill material is underlain by Outwash Sand in Boreholes T3, 7, 8 and 47/31. The Outwash Sand is typically grayish, medium to fine SAND with a trace of SILT. SPT 'N' values of 23 to 38 blows per foot indicate a compact to dense condition.

Outwash Sand thicknesses of 5.0 and 6.5 feet were encountered in Boreholes 7 and T3 which penetrated the bottom of this stratum.

Index test results for a sample of Outwash Sand indicate a uniform, non-plastic fine to medium SAND with a classification of SP under the USCS (see Table 5-9).

The following engineering properties were recommended for preliminary foundation design of a treatment plant by the West Hide Pile (Golder, 1990h):

	Saturated Unit Weight (pcf)	Friction Angle (deg.)	Cohesion (psf)
Surficial (Fill)	100	0	0
Outwash Sand	125	36	0
Glacial Till	130	40	0

The conclusions of the PDI Task S-4 for potential treatment plant foundations by the West Hide Pile were as follows (Golder, 1990h):

- The surficial (fill) material was considered to be an unsuitable foundation bearing stratum due to its heterogeneity and poor engineering properties;

- The Outwash Sand and the underlying Glacial Till were both considered to be suitable foundation strata;

- Extensive dewatering would be required to construct spread footing foundations in the Outwash Sand because of high groundwater conditions. Spread footings were therefore not considered to be a practicable, cost-effective alternative;

- Pile foundations driven to refusal into the Outwash Sand and/or underlying till were considered to be the most suitable foundation type for this location; and,

- The friction component of pile bearing capacity in the surficial fill material should be neglected.

5.7.2.5 Potential Treatment Plant by East Hide Pile

A potential gas treatment plant location was investigated adjacent to and east of the East Hide Pile. Borehole and test pit locations are shown on Sheet 5-7. The stratigraphy at this site, in descending order, consists of Surficial Material (overburden) and bedrock.

Surficial Material

The Surficial Material was classified as "overburden" on the PDI borehole and test pit logs. The overburden consists of topsoil, weathered rock, and possibly Glacial Till and fill.

Topsoil and roots, about 0.5 feet in thickness, generally at the surface. The underlying overburden is typically a brown to grey medium to fine SAND with occasional cobbles. SPT 'N' values of 8 to 26 blows per foot indicate a loose to compact condition. Few samples of the overburden were recovered for laboratory testing because of the shallow depth to bedrock. Index test results on one SPT sample of overburden show that it is a non-plastic SAND with little

SILT and a USCS classification of SP-SM (refer to Table 5-9). Oversize material such as coarse gravel, cobbles and boulders with a diameter up to about 3 feet were encountered in the overburden.

The overburden thickness was highly variable, ranging from zero, where the bedrock outcrops, to 1.0 foot in Test Pit P3 and 4.0 feet in Test Pit P1A. It is roughly estimated that the overburden could locally be 12 to 14 feet thick.

Bedrock

The flight auger boreholes encountered refusal after penetrating 1.0 to 1.5 feet into the weathered bedrock. All test pits except Test Pit P1 were terminated where bedrock was encountered at depths of 1.0 to 4.0 feet below ground surface. Test Pit P1 was terminated and backfilled immediately when hide residue was encountered at 1.5 foot depth.

The conclusions of the PDI Task S-4 for potential treatment plant foundations by the East Hide Pile were as follows (Golder, 1990h):

- Shallow foundations (footings or mats) bearing on slightly weathered bedrock were recommended;

- Experience indicates that this type of rock can develop an allowable bearing capacity in the order of 4 to 10 tons per square foot;

- In no case should the foundation be constructed partly on overburden and partly on rock, in order to avoid differential settlements;

- The bottom of the excavations into suitable rock may have to be stepped, and in no case should the foundations be constructed on an inclined rock surface; and,

- It is essential that the bottom of the foundation excavations be inspected by an experienced geotechnical engineer to verify that slightly weathered, moderately jointed rock has been reached on the entire foundation area.

Oversize material (cobbles and boulders) can be expected in the overburden excavations, and the top of bedrock is expected to be irregular.

5.7.2.6 Potential Treatment Plant by Chromium Lagoons

A potential groundwater treatment plant location was investigated adjacent to and north of the Chromium Lagoons. Borehole and test pit locations are shown on Sheet 5-7. The stratigraphy at this site, in descending order, consists of Surficial Material (fill), Outwash Sand, Glacial Till and bedrock.

Surficial Material

The Surficial Material was classified as "fill" on the PDI borehole and test pit logs, and as "waste" on the RI/FS borehole logs. The fill is predominantly a variable color, silty SAND and GRAVEL with localized clay zones, and included slag and bricks. The variability of the fill is further indicated by the SPT 'N' values which range from 2 to 37 blows per foot and generally increase with depth. The 'N' values indicate the fill material varies from very loose to dense. Index test results on three samples of the fill material show that it consists of non-plastic fine to coarse SAND with some GRAVEL and some SILT, and is classified as SM under the USCS. Specific gravity and Modified Proctor compaction tests on a sample of fill material indicates a high specific gravity of 3.63, and a maximum dry density of 127.0 pcf at an optimum moisture content of 15.0 percent (see Table 5-9).

Fill material was encountered in all boreholes and test pits. All boreholes penetrated through the fill, which was 8 to 10 feet thick. Test pits did not penetrate to the bottom of the fill because of the high water table. Test Pit P10 encountered a buried pipe and concrete casing at a depth of 3 to 4 feet. The test pit was moved east of the originally proposed location because of an abandoned concrete slab foundation.

A thin, discontinuous layer of "peat" was recorded on several of the RI/FS borehole logs at this location. The material was encountered between the fill and the underlying Outwash Sand. For engineering purposes, this layer is interpreted as organic silt. The layer is generally less than 1 foot thick.

Testing of the fill for sulfate content indicates that it locally contains greater than 2,000 ppm sulfate. Foundation materials might also be in contact with hide residue containing organic acids. Therefore, the fill should be considered to be a corrosive environment to certain types of concrete and steel.

Outwash Sand

The surficial (fill) material is underlain by Outwash Sand. The Outwash Sand is typically a uniform, non-plastic, medium to fine SAND with a trace of SILT. SPT 'N' values range from 6 to 35 blows per foot. Index test results for samples of the Outwash Sand show it to be a non-plastic, uniform SAND classified as SP under the USCS (refer to Table 5-9).

This stratum appeared to decrease in thickness in a north/northwest direction from 22 feet to 2 feet.

Glacial Till

The Outwash Sand is underlain by Glacial Till. The till is typically olive to grey SAND with minor amounts of GRAVEL and SILT. SPT 'N' values of 41 to more than 100 blows per foot indicate a dense to very dense condition. However, the high 'N' values may also have been caused by coarse gravel, cobbles and boulders in the till which were not recovered in the 1.375 inch diameter SPT sampler.

The till varies in thickness from 2 to 19 feet.

Bedrock

Borehole OW-14 penetrated 16.0 feet into the bedrock. Borings T5 through T9 each encountered bedrock at depths of 10 to 32 feet. The bedrock consists of slightly to moderately weathered METAGABBRO.

The conclusions of the PDI Task S-4 for the treatment plant foundations by the Chromium Lagoons were as follows (Golder, 1990h):

- The surficial (fill) material was considered to be an unsuitable foundation soil due to its heterogeneity and poor engineering properties;
- The underlying Outwash Sand and/or Glacial Till strata were considered to be competent foundation soils for spread footing or driven pile foundations;
- The groundwater table is in the Surficial Material and, therefore, dewatering of the excavation would be required to construct footings in the Outwash Sand;
- Pile foundations driven to refusal in the Outwash Sand and/or Glacial Till are an alternative to spread footings; and,
- Other factors to be considered when selecting the foundation type are as discussed in Section 5.7.2.4 for the West Hide Pile.

The property on which the Chromium Lagoons are located is known to contain underground utilities and also abandoned facilities above grade (see Sheets 5-3C, 5-4 and 5-5). The underground utilities include abandoned water supply, process water, waste water lines, electrical conduits, and an in-service sanitary sewer. The type and location of abandoned underground utilities was obtained from correspondence, reports and drawings prepared by others. The number and type of abandoned underground utilities shown on Sheet 5-5 may be incomplete and the locations are approximate.

The following engineering properties were recommended for preliminary foundation design for a potential treatment plant by the Chromium Lagoons (Golder, 1990h):

	Saturated Unit Weight (pcf)	Friction Angle (deg.)	Cohesion (psf)
Surficial (Fill) Material	100	0	0
Outwash Sand	125	36	0
Glacial Till	130	40	0

5.7.2.7 Future Site Development Area

The area investigated for future Site development is between Commerce Way and Interstate 93 (see Sheet 5-7). The geotechnical information indicates that soil conditions vary significantly across this area (Golder, 1990h). The stratigraphy varies locally within this area. The strata encountered in descending order consisted of Surficial Material, Outwash Sand, Glacial Till and bedrock. However, some of these strata were locally very thin or absent. The following is a general description of the soil conditions based on data obtained from relatively few geotechnical boreholes and test pits which were widely spaced across the 70 (+/-) acre area.

Surficial Material

The Surficial Material was classified as "topsoil, fill or overburden" in the PDI borehole and test pit logs, and as "fill" in the RI/FS borehole logs. Except for 0.5 to 1.0 feet of topsoil encountered in Test Pits P11 and P12, no Surficial Material was encountered in the northeastern part of the Site. In the east-central part of the Site, Surficial Material 2.8 to 9.0 feet thick was encountered in Test Pits P16, P18 and P18A, and in RI/FS Boreholes OW-4 and OW-16. The Surficial Material consists predominantly of boulders and cobbles. No Surficial Material was recorded in Test Pits P15 and P17. In the southeastern part of the Site, Surficial Material, 0.7 to 14 feet in thickness, was encountered. A 2.0-foot layer of Surficial Material in Test Pit P19 consisted of cobbles and boulders. This material is probably rock fill from the previous bedrock quarry operation in this vicinity. RI/FS Borehole OW-5 at the south side of Phillips Pond encountered 11 feet of "silty peat" below 3.0 feet of fill.

Outwash Sand

Outwash Sand, 2.5 feet to more than 7.0 feet in thickness, was encountered below ground surface in six of the seven boreholes and test pits in the northeastern part of the Site. Outwash Sand was absent in Borehole OW-2 where Glacial Till was exposed at ground surface. In the east-central part of the Site, Outwash Sand thicknesses of 2.5 to 17.5 feet were recorded in three of the eight boreholes and test pits. Test Pits P18 and 18A were terminated in the overlying Surficial Material. Outwash Sand was absent in Borehole SD-1 or in Test Pits P16 and P17. In the southeastern part of the Site, Outwash Sand thicknesses range from 2.5 feet to more than 27.05 feet in four of the five boreholes and test pits. Outwash Sand was absent in Test Pit P19.

Index test results for four samples of the Outwash Sand indicate that it consists of uniform medium to fine SAND with little to some non-plastic SILT. The sand is classified as SM under the USCS. SPT 'N' values ranged from 5 to 21 blows per foot indicating a loose to compact condition.

Glacial Till

In the northeastern part of the Site, Glacial Till thicknesses range from 5.0 to 10.0 feet in Boreholes OW-2 and OW-3 which penetrated through this stratum. The till was penetrated to thicknesses of 2.2 feet to 12.5 feet in Borehole SD-4 and Test Pits P12 and P14. Till was not encountered in Test Pit P11 which was terminated in the overlying Outwash Sand.

In the east-central part of the Site, Boreholes OW-4 and OW-16 penetrated through 7.5 to 13.5 feet of till into the underlying bedrock. Borehole SD1 was terminated after penetrating 21.0 feet into the till. Glacial Till was not recorded in Test Pits P16 and P17.

In the southeastern part of the Site, Boreholes SD2, OW-5 and OW-15 penetrated through 2.0 to 9.5 feet of Glacial Till into the underlying bedrock. Boreholes SD3 and Test Pit P19 were terminated in strata overlying the Glacial Till. Till was not encountered in Test Pit P19 where bedrock was directly overlain by Surficial Material.

Index test results for 3 samples of the till indicate that it consists of broadly-graded, non-plastic, fine to coarse

SAND and GRAVEL with a little to some SILT. The till is classified as GW-GM to SM under the USCS. The Glacial Till is expected to contain oversize material such as coarse gravel, cobbles and boulders which could not be recovered in the 1.375 inch diameter SPT sampler. The SPT 'N' values for the Glacial Till ranged from 34 to over 100 blows per foot indicating that the till is dense to very dense. It is expected that oversize material in the till contributed to the high penetration resistance.

Bedrock

The depth to bedrock varied widely across the future Site development area. In the northeastern part of the Site, the top of bedrock is 7.5 to 10.0 feet below ground surface in Boreholes OW-2 and OW-3. The other boreholes and test pits were terminated before bedrock was reached at depths ranging from 5.8 to 17.0 feet.

In the east-central part of the Site, weathered bedrock outcropped at ground surface at Test Pit P17. Bedrock was encountered at 3.5 to 34 feet below ground surface in Test Pit P16 and Boreholes OW-4 and OW-16. Backhoe bucket refusal at 2.8 feet below ground surface in Test Pit P18 was probably close to the bedrock contact. Borehole SD1 and Test Pit P15 were terminated above the top of bedrock, at depths of 22.0 and 6.0 feet.

In the southeastern part of the Site, bedrock was encountered at between 2.0 and 24.5 feet below ground surface in Test Pit P19 and in Boreholes OW-5 and OW-15. Boreholes SD2 and SD3 were terminated above the top of bedrock at depths of 6.5 and 27.75 feet.

The conclusions of the PDI Task S-4 for the foundations in the future development area east of Commerce Way were as follows (Golder, 1990h):

- The investigation has shown that soils having sufficient bearing capacity to support shallow foundations generally exist within 3 to 8 feet below ground surface;
- Shallow foundations such as spread footings or mats would probably be most economical where the groundwater table is not close to ground surface;
- Where groundwater is close to surface, driven pile foundations may be more economical than shallow foundations because of the extra cost of excavation and dewatering for shallow foundations; and,
- More specific recommendations were not considered to be appropriate at this stage due to the significant variability of the Surficial Materials and the relatively small amount of geotechnical information available.

Site-specific factors such as depth to bedrock, and the presence of cobbles and boulders in the Surficial Materials should also be considered in selecting the foundation types.

5.7.3 Groundwater Conditions

Groundwater conditions observed in the PDI Task S-2 and S-4 boreholes and test pits are summarized in this section. The groundwater elevations are approximate because in most cases the depth to groundwater was recorded during or upon completion of the borehole or test pit.

5.7.3.1 East and West Hide Piles

Groundwater was observed in all the boreholes at the East and West Hide Piles. Except for Task S-2 Boreholes 5, 12, 13, and 15, the groundwater elevations observed during or after drilling were within 3 feet below the water level in the adjacent wetland. However, the groundwater elevation in Borehole 12 measured 2 days after drilling was about 11.5 feet above the water elevation in the wetland. The groundwater elevation observed in Borehole 13 during drilling was 1.5 feet above the water elevation in the wetland. Water levels observed during drilling were considered to be lower than water levels which would be observed at a later date due to the time required for groundwater to enter the borehole and come to equilibrium. The observed water levels indicate that groundwater conditions were controlled by water elevations in the wetlands, and also that there was some mounding of the water table and possibly perched water tables within the hide piles.

5.7.3.2 Potential Treatment Plant by West Hide Pile

Groundwater was observed in all boreholes and test pits within 0.3 to 3.5 feet below ground surface at the location of this potential treatment plant. The corresponding groundwater elevations were within 2.0 feet below the water elevation in the adjacent wetland. This groundwater depth range was in the upper part of the Surficial Material described in Section 5.7.2.4 and is therefore significant in relation to Site grading and excavation for shallow foundations and selection of foundation type. Much of this treatment plant site was flooded during the investigation. The 4 test pits were terminated at depths of 0.3 to 2.3 feet due to sloughing in high groundwater conditions.

5.7.3.3 Potential Treatment Plant by East Hide Pile

This area is well-drained and is situated on high ground where the bedrock locally outcrops. Groundwater was not observed in any of the boreholes or test pits at this site.

5.7.3.4 Potential Treatment Plant by Chromium Lagoons

Groundwater was observed in all the boreholes and test pits at depths of 4 to 8.5 feet below ground surface, which is within the lower 0 to 2 feet of the Surficial Material. As for the treatment plant site by the West Hide Pile, the groundwater elevation is significant in relation to design of excavations and selection of foundation type. Both test pits were terminated at depths of 5.0 and 7.0 feet due to sloughing of the pit walls and groundwater conditions.

5.7.3.5 Future Site Development Area

In the northeastern part of the Site, groundwater was observed at depths of 4.0 and 7.0 feet below ground surface in Test Pits P11 and P13, and the soil sample recovered at 5.0 foot depth in Borehole SD4 was described as "saturated". These depths correspond to groundwater elevations ranging from 64.6 feet to 66.6 feet. Test Pits P11 and P13 were terminated due to sloughing. No groundwater was observed to depths of 8.0 feet and 6.0 feet below ground surface in Test Pits P12 and P13. These depths correspond to test pit bottom elevations of 65.9 feet and 65.2 feet, respectively.

In the east-central part of the Site, groundwater was observed at depths of 2.3 to 7.8 feet below ground surface in Borehole SD1 and in Test Pits 15, 17 and 18A. These depths correspond to groundwater elevations ranging from 64.8 feet to 72.5 feet. Test Pits P15 and P18A were terminated at depths of 4.5 and 7.8 feet below ground surface due to sloughing. No groundwater was observed to depths of 2.8 and 7.0 feet below ground surface in Test Pits P16 and P18, which corresponds to test pit bottom elevations of 66.9 feet and 69.7 feet respectively.

In the southeastern part of the Site, groundwater was observed in all the boreholes and test pits at depths of 2.0 to 9.6 feet below ground surface. These depths correspond to groundwater elevations ranging from 63.3 feet to 66.4 feet, respectively. Test Pit P19 was terminated at 7.5 foot depth below ground surface due to sloughing.

5.8 PHYSICAL HYDROGEOLOGY

This section summarizes the physical hydrogeological site characterization studies which were conducted to assess groundwater flow patterns and aquifer conditions to support the Remedial Design for the groundwater extraction and recharge systems. A detailed description of hydrogeologic condition at the Site is presented in Chapter 6.

The following PDI tasks were implemented in order to obtain additional data to supplement that collected during the RI/FS (Stauffer, 1983, 1984, 1985) for design of the remedy for groundwater (Golder, 1989):

Task GW-1	Plume Delineation (Golder, 1991c, and 1991d)
Task GW-2	Hydrogeological Characterization for the Extraction/Recharge System (Golder, 1990f, 1991e, 1991f)
Task GW-3	Groundwater Treatability (Golder, 1991g)

The objective of Task GW-1, Plume Delineation, was to supplement the data from the RI/FS to assess the extent of Hazardous Substances in the unconsolidated deposits. These data, together with information obtained from the RI/FS and the Phase I GSIP RI, provide input for the location and design of the extraction system. These data were also used to select the location of the aquifer pump test for Task GW-2.

The objective of Task GW-2, Hydrogeological Characterization for the Extraction/Recharge System, was to provide the aquifer data and hydraulic coefficients required for design of the extraction and recharge systems.

The purpose of the PDI Slug Test investigation was to determine the spatial variability of the hydraulic conductivity due to aquifer heterogeneities identified in the area proposed for the location of the groundwater extraction system. The second aquifer pumping test was intended to provide aquifer parameters in the location of the proposed extraction system, to perform a pilot test of part of the pumping system, and to provide information on the unconfined aquifer in an area where there were stratigraphic data gaps.

Task GW-3 did not provide data on the physical hydrogeology of the Site.

The Phase I GSIP RI (Roux, 1991a) performed several rounds of groundwater level measurements which were also considered in assessing the physical hydrogeology of the Site.

The PDI Tasks GW-1, GW-2, and GW-3 reports, and the Phase I GSIP RI (Roux, 1991a, 1991b) should be consulted for further information.

For the purposes of this presentation, the Supplemental Pre-Design Investigation of the Arsenic Pit and Chromium Lagoons (Golder, 1991d) has been included in Task GW-1 and the second aquifer pumping test (Golder, 1991f) has been included in Task GW-2.

5.8.1 Field and Laboratory Programs

The field programs for PDI Tasks GW-1 and GW-2 are outlined below.

5.8.1.1 Field Programs

Task GW-1 Plume Delineation

The field program for Task GW-1, Plume Delineation, as described in the PDI Work Plan consisted of several subtasks to assess the areal and vertical extent of Hazardous Substances in groundwater in the unconsolidated deposits on-Site and also downgradient of the Site. The subtasks were as follows (Golder, 1991c):

Subtask 1	Determination of Aquifer Thickness and Boundaries;
Subtask 2	Installation of PDI Phase 1 Monitoring Wells;
Subtask 3	Sampling of PDI Phase 1 Monitoring Wells;
Subtask 4	Installation of PDI Phase 2 Monitoring Wells; and,
Subtask 5	Sampling of PDI Phase 2 Monitoring Wells.

Subtask 1 included aerial photograph interpretation and field mapping to identify bedrock outcrops. Twenty-one boreholes (ATB1 through ATB21) were drilled to bedrock to determine the thickness, boundaries and lithology of the unconsolidated deposits. The ATB boreholes were drilled with a hollow stem auger drill rig. Soil samples were obtained at 5-foot depth intervals with a split spoon sampler. When refusal to auger drilling occurred, the top of bedrock was verified by coring through the hollow stem augers approximately 3 feet into the bedrock. The boreholes were backfilled with bentonite grout injected through a tremie pipe.

In Subtask 2, fourteen Phase 1 monitoring wells were installed at eight locations downgradient of the Site. The wells were installed to determine the extent of benzene, toluene and other substances in the groundwater, and also to better assess the thickness and boundaries of the unconsolidated deposits. The locations for the Phase 1 monitoring wells were selected from review of hydrogeologic and water quality data available from the Phase I GSIP RI and also Subtask 1 of Task GW-1. Phase 1 wells were identified as OW-23 through OW-27, OW-29, OW-30 and OW-33. Two additional monitoring wells, OW-31 and OW-32, were installed during PDI Task S-2, Stability of Hide Piles (Golder, 1990c). Except for OW-23, OW-29, OW-31 and OW-32, a two-well cluster, identified by the suffixes "A" and "B," was installed at each location. These well clusters were installed at separate depths within the saturated, unconsolidated deposits to better assess any possible stratification of Hazardous Substances and vertical components of groundwater flow. The screened depth intervals were selected in the field on the basis of greater permeability indicated by visual sample inspection, and/or zones which exhibited high concentrations of total Volatile Organic Compounds (VOC's) as determined with a photoionization detector.

All but four of the Subtask 2 (Phase 1) monitoring wells were installed with a hollow stem auger. Dual rotary drilling equipment was required to penetrate the Glacial Till. Split spoon samples were obtained from the unconsolidated deposits and core samples were obtained from the upper 3 feet of the bedrock. The monitoring wells consisted of 4-inch diameter Schedule 40 flush-joint polyvinylchloride (PVC) casing with 0.01-inch slot 4-inch diameter Schedule 40 PVC well screen. Number 20 Ottawa sand was placed around the screened section and to at least

2 feet above the screen. The borehole annulus above the sandpack was filled with bentonite grout injected through a tremie pipe and protective steel casings or meter boxes were placed over the wells. The wells were developed by pumping with centrifugal or submersible pumps. Where reasonably practicable, the wells were pumped until the water was clear and free of sediment.

In Subtask 3, depths to groundwater were measured and water samples were collected from the Phase 1 monitoring wells, including OW-31 and OW-32. The samples were collected between June 4 and June 6, 1990 using a Teflon bailer. Temperature, pH and specific conductance were measured in the field.

In Subtask 4, the locations for additional (Phase 2) monitoring wells were selected to better define the extent of benzene and toluene "hot spots," based upon an evaluation of the water quality data obtained during the Phase I GSIP RI and PDI Phase 1 well sampling programs. Seven Phase 2 monitoring wells, identified as OW-36 through OW-42, were installed. Drilling procedures, bedrock coring, well completion and development details were similar to those for the Phase 1 monitoring wells.

In Subtask 5, groundwater levels were measured and groundwater samples were obtained from total of 25 monitoring wells installed at 23 locations during the RI/FS, the Phase I GSIP RI, and PDI Task GW-1 Phase 1 and Phase 2. This work was done between October 15 and 18, 1990. Sampling details are described in Golder (1991c).

An additional groundwater investigation was performed in the vicinity of the Arsenic Pit and Chromium Lagoons to assess if they were source areas for mobile metals in groundwater. Eleven new monitoring wells were installed at eight locations in accordance with the protocol established for Task GW-1 in the PDI Work Plan (Golder, 1991d). A complete synoptic round of water level measurements was performed and eleven pre-existing RI/FS and PDI groundwater monitoring wells were sampled along with the eleven new wells.

Task GW-2 Hydrogeological Characterization for the Extraction/Recharge Systems

The field program for PDI Task GW-2, Hydrogeological Characterization for the Extraction/Recharge Systems, consisted of two aquifer pump tests and a series of slug tests to determine the hydraulic characteristics of the aquifer for design of the groundwater extraction system, and a recharge test to determine the percolation rate for design of the treated groundwater recharge system (Golder, 1990f, 1991e, 1991f).

First Aquifer Pump Test

For the first aquifer pump test, one pumping well (PW-1), eight temporary observation well pairs (TW-1S and D through TW-4S and D), and temporary observation well TW-5, were installed between October 1 and 11, 1990. The pump test was located off-Site, approximately 200 feet east of Halls Brook Holding Area and 1100 feet south of the Boston Edison Right-of-Way No. 9. Pumping well PW-1 was installed by dual-rotary drilling equipment using water for the drilling fluid. The bottom three-tenths of the Outwash Sand was screened with a 19-foot long, 8-inch diameter, 0.10-inch slotted stainless steel well screen and 8-inch diameter steel casing. The screened interval was gravel packed with minus No. 4 Sieve sand which extended 6 feet above the top of the well screen. The borehole annulus was sealed with bentonite pellets and with bentonite grout.

Except for well TW-5, the temporary observation wells were installed with hollow stem auger drilling equipment. Each temporary well pair TW-1 through TW-4 consisted of one shallow well and one deep well, which were identified as TW-1S, TW-1D, etc. Split spoon samples were recovered at 5 foot depth intervals from TW-1D in order to obtain further information on the lithology and saturated thickness of the aquifer. The temporary well pairs were constructed with 2-inch diameter, 5-foot long, 0.010-inch slotted PVC well screens and 2-inch diameter PVC casing. The well screens in the shallow temporary wells were either at the midpoint or in the upper 25 percent of the Outwash Sand. Temporary well TW-5 consisted of a 1.5-inch diameter stainless steel piezometer which was hand-driven through the stream bed of Halls Brook. A 3-foot long, 0.014-inch slotted screen was installed in this well with the top of the screen 2 to 3 feet below the stream bed.

The location and orientation of the temporary observation well pairs were selected on the basis of aquifer boundary conditions and expected well yields. Pumping well PW-1 and temporary well pairs TW-1 to TW-4 were developed with a centrifugal pump, and TW-5 was developed with a peristaltic pump.

The pump test consisted of a step-drawdown (step) test and a constant-rate (pumping) test. The step test was conducted to assess the performance of the aquifer at different pumping rates and to select a pumping rate for the subsequent constant rate test. The step test consisted of pumping well PW-1 at five successively larger discharge rates, for 1 to 2 hour periods. Step tests were performed on October 26, 1990 at discharge rates of 145 - 150 gallons per minute (gpm), 250 gpm, 350 gpm, 400 gpm and 450 gpm. An optimum pumping rate of about 350 gpm was selected for the subsequent pump test.

The constant rate pumping test was conducted to obtain data from which to calculate the following hydraulic parameters of the aquifer: the vertical and horizontal hydraulic conductivity (permeability), the transmissivity, the storage coefficient, and the degree of anisotropy. The 48-hour pump test began on October 31, 1990 and was terminated on November 2, 1990. Static water levels were measured immediately before testing. Water levels were measured during pumping in the pumped well (PW-1), temporary observation well pairs TW-1 to TW-4, temporary observation well TW-5, and observation wells OW-19, OW-19A, OW-24A, OW-24B, OW-33A, and OW-33B. The test data for the pumped well and the 15 observation wells were plotted as drawdown versus elapsed pumping time and analyzed to determine the hydraulic coefficients (Golder, 1990f).

During the pump test, the pump well discharge was monitored for specific constituents on a real-time basis so that the pump test could be terminated if concentrations of targeted analytes exceeded established action levels for discharge to the Halls Brook Holding area. Forty-nine water samples were collected for analytical testing for arsenic and VOC's.

PDI Slug Test

Aquifer heterogeneities are expected to occur in the area where the groundwater extraction system will be installed. For this reason, a series of slug tests was conducted in observation wells within the Site, close to the proposed locations of the extraction system, and also in the observation wells which were installed for the first aquifer pump test (Golder, 1991d).

The objectives of the slug test investigation were:

1. To compare hydraulic conductivities derived from slug tests with those obtained from the pump test, and if the results were comparable, to determine if slug test data from the proposed extraction system area and pump test data were similar; and,

2. To provide the basis for adjusting the pump test data to conditions in the proposed extraction system area if the slug test results showed different hydraulic conductivities.

The slug tests were performed during the week of November 5, 1990, in a total of 30 wells. Twelve of these wells were in the contaminant plume area, eight were in the proposed groundwater extraction area and ten were in the pump test area. The slug test procedures for each well provided both falling-head and rising-head test data. The falling-head test was performed by quickly lowering a PVC slug into the well to displace a volume of water and monitoring the subsequent rate of return to equilibrium water level. The rising-head test was conducted after equilibrium was reached by quickly removing the slug to depress the water level and monitoring the subsequent rate of return to equilibrium water level.

The slugs were constructed from 5-foot long sections of 1-inch or 2-inch diameter PVC pipe which were filled with sand ballast. The water levels were measured during the slug test with a vibrating wire transducer which was monitored and recorded at a set scan interval by a portable computer and data logger. The rising-head and falling-head tests provided the data for computing two hydraulic conductivity values, and when the data were analyzed by two different methods, four hydraulic conductivity values were determined for each well.

Second Aquifer Pump Test

A second aquifer pumping test was performed during October, 1991. Twelve piezometers were installed by hollow stem auger drilling methods, with split spoon sampling either continuously or every five feet in order to better assess the stratigraphy in the pumping test area. A continuously sampled pilot hole was drilled at the location of the pumping well (proposed extraction well E-5), and the retained samples were submitted for sieve analysis in order to design the screen and gravel pack for the pumping well. The pumping well (E5) was located such that it could serve as part of the future extraction system. The pumping well was installed by air rotary drilling using a Barber drilling rig, and was screened through the entire saturated thickness of the Outwash Sand. Two of the piezometers were completed in the bedrock to assess the potential hydraulic connection between the unconsolidated materials and the shallow bedrock. Bedrock core was recovered from the top 20 feet at these two locations to inspect the condition of the shallow bedrock in terms of weathering and fracture intensity.

A 72 hour constant rate pumping test was performed at a rate of 120 gallons per minute, and the effluent was treated by an on-Site skid-mounted carbon treatment system prior to discharge to surface water. The treated effluent was analyzed by an on-Site laboratory for benzene, toluene, ammonia, arsenic, chromium, iron, copper, and zinc on an hourly basis. Piezometers and nearby monitoring wells were instrumented with pressure transducers connected to digital data loggers to record water level measurements during the test. Manual measurements were also taken as a back-up. A recovery was conducted immediately following the constant rate pumping test for a period of 24 hours.

The results of the test were interpreted to calculate aquifer parameters (transmissivity, hydraulic conductivity, storage coefficient), to assess anisotropy in the Outwash Sand, to assess potential hydraulic communication between the shallow bedrock and the Outwash Sand, and to evaluate boundary effects.

Recharge Test

The aquifer recharge test was conducted in a 69-hour period from November 6, 1990 to November 9, 1990. The recharge test site was located approximately 600 feet north of Atlantic Avenue and 1000 feet east of the MBTA railway. The test basin was constructed on October 24, 1990. It consisted of an excavation approximately 15-feet long by 7-feet wide. The test basin was excavated to the water table about 3.0 feet below ground surface. Three piezometers were installed in the basin to measure groundwater levels below the basin and also the "mounding" of recharge water during the recharge test. These three piezometers consisted of 2.5-foot long, 2-inch diameter, 0.010-inch slot PVC well screen and casing. The basin was recharged with City of Woburn water by a 4-inch diameter, 0.040-inch slot PVC well screen connected to a fire hose.

The basin was backfilled with clean, uniform, 2-inch diameter crushed stone, which had a permeability several orders of magnitude higher than the fine to medium sand, silt, cobbles and fill material which was excavated from the test basin. Two additional piezometers were installed about 2 feet and 10 feet south of the test basin to measure the groundwater "mounding" during the test. These two piezometers were installed with a hollow stem auger drill rig and consisted of 5-foot long, 2-inch diameter PVC well screen and casing, with the screened interval intersecting the water table. The well screens were gravel packed to 0.5 feet below ground surface and the remaining annulus was sealed with bentonite to prevent infiltration of surface water. The piezometers were developed with a bailer before the recharge test.

The recharge test was conducted until water levels in the test basin and in the piezometers outside the basin varied minimally with time. The rate of inflow to the basin was monitored and adjusted so that the water did not overflow the basin. After initial trial inflow rates of 5 gpm and 1 gpm, it was observed that an inflow rate of 2 gpm produced steady-state water level in the basin and in the groundwater adjacent to the basin.

5.8.1.2 Laboratory Programs

Task GW-1 Plume Delineation

Ten soil samples recovered from the Phase 1 monitoring well installations (Subtask 2) were tested in the laboratory for grain size distribution.

Task GW-2 Hydrogeologic Characterization for the Extraction/Recharge System

Samples which were collected from the first pump test well discharge were tested on a real-time basis for arsenic, benzene, toluene and trichloroethylene. The tests were performed in field laboratory facilities on the Site using rapid test procedures which were previously approved by USEPA. None of the test results exceeded the action levels established for pump test analytes which were (Golder, 1990f): total arsenic, 1990 ppb; benzene, 22 ppb; toluene, 8,740 ppb; and trichloroethylene, 22 ppb.

Recovered samples from the second pump test extraction well pilot hole were retained and submitted for sieve analysis in order to design the well screen and gravel pack for the pumping well. Samples from four separate depth intervals (11.5 to 19.5, 19.5 to 31.5, 31.5 › 41.5, and 41.4 to 51.5 feet below ground surface) were composited to produce four separate samples for sieve analysis. The results are presented in Golder (1991f).

The PDI Slug Test and Recharge Test did not include a laboratory testing program.

5.8.2 Aquifer Thickness and Boundaries

In general, the unconfined aquifer consists of Outwash Sand, which was deposited upon discontinuous Glacial Till or bedrock, and in portions of the Site overlying recent sediments and fill. The Outwash Sand lithology reflects the different depositional cycles and is generally composed of well to poorly sorted sand and gravel with interbedded boulders, cobbles, silt and clay. The overlying recent deposits include sand and silt, with interbedded gravel, organic matter and silt.

The aquifer thickness and boundaries were determined by evaluating the data obtained during the RI/FS, the PDI, the Phase I GSIP RI, and data provided by GZA (Golder, 1991f). The elevation of the bottom of the Outwash Sand is shown on Sheet 6-4. The bottom of the Outwash Sand elevations are either the top of bedrock in areas where the Glacial Till is not present, or the top of Glacial Till where till is present. Because the Glacial Till is thin or discontinuous under the Site, the bottom of the Outwash Sand is considered to be indicative of the configuration of the top of bedrock and the preglacial valleys.

The aquifer thickness varies across the Site and, to a large extent, is determined by the configuration of the top of bedrock. The Outwash Sand thins toward the north part of the Site between the MBTA railway and Commerce Way. The Outwash Sand is also relatively thin west of the MBTA railway, and between Commerce Way and Interstate 93. The Outwash Sand thickness increases from the Boston Edison Right-of-Way No. 9 toward the south where the two on-Site preglacial valleys converge into a single deeper and better defined valley. The thickest part of the Outwash Sand is south of the Site near the south end of Halls Brook Holding Area and north of Mishawum Road.

5.8.3 Groundwater Elevations

The groundwater elevations were measured during synoptic rounds at least twelve times between April, 1990 and October, 1991 in a total of up to 74 wells which were installed for the RI/FS, the PDI, and the Phase I GSIP RI. These data were used to determine groundwater flow patterns, hydraulic gradients and the saturated thickness of the unconfined aquifer.

Groundwater elevations generally range from approximately 72 to 75 feet in OW-1A to 55 feet in OW-50. Observation well OW-1A is located outside of the northwest corner of the Site, and OW-50 is located at the southern end of the Site adjacent to the MBTA railway. The depth to groundwater generally ranges from about 0 to 17 feet below ground surface. Horizontal hydraulic gradients generally range from about 0.002 feet/foot to 0.009 feet/foot. Vertical hydraulic gradients range from 0.028 feet/foot upward to 0.006 feet/foot downward.

5.8.4 Hydraulic Coefficients

The hydraulic coefficients were determined from the results of the PDI pump tests and slug tests. The range of average hydraulic coefficients which were developed from the first pump test are as follows (Golder, 1990f):

Horizontal Hydraulic Conductivity (K_r)	1.3×10^{-2} to 1.2×10^{-1} cm/sec
Degree of Anisotropy (K_z/K_r) (Vertical/Horizontal Conductivity)	0.002 to 0.03
Specific Yield (S_y)	0.01 to 0.22.

The horizontal hydraulic conductivity (K_r) increased with depth and was relatively constant within similar screened zones of the unconfined aquifer.

The hydraulic conductivity determined from the slug tests ranged from 1.3×10^{-1} centimeters per second (cm/sec) to 5.5×10^{-4} cm/sec, which is considered to be typical for the clean to silty sands in the aquifer.

The results of the second aquifer pump test generally confirmed the conclusions of the slug tests. The range of average hydraulic coefficients which were developed from the second pump test are as follows (Golder, 1991f):

Horizontal Hydraulic Conductivity (K_r)	1.9×10^{-3} to 2.0×10^{-1} cm/sec (usually about 2.0×10^{-2} cm/sec)
Vertical Hydraulic Conductivity (K_r)	1.5×10^{-6} to 2.8×10^{-2} cm/sec (usually about 5×10^{-3} cm/sec)

Other aquifer parameters derived from the second pump test include:

Specific yield (Sy)	0.032 to 0.29
Elastic Storage coefficient (S)	2.5×10^{-4} to 3.4×10^{-2}
Specific Elastic Storage (S_s)	3.5×10^{-6} to 1.1×10^{-4} ft^{-1}

5.9 EXTENT OF HAZARDOUS SUBSTANCES

This section summarizes the results of the PDI tasks which assessed the extent of Hazardous Substances in order to support the Remedial Design for soil, groundwater and air. The ROD (USEPA, 1986a), the Consent Decree/RDAP (USEPA, 1989a), and the Pre-Design Work Plan (Golder, 1989) should be consulted for further information.

The field and laboratory programs for the extent of Hazardous Substances in the Soil are discussed in Section 5.9.1. Hazardous Substances in Wetlands and Surface Water Sediments are described in Section 5.9.2. Hazardous Substances in Groundwater are discussed in Section 5.9.3, and Hazardous Substances and odors in air are summarized in Section 5.9.4.

5.9.1 Soil

In general, the remedy for Hazardous Substances in soil as stated in the RDAP (USEPA, 1989a) is as follows:

> "The remedial action for soils, sediments and sludges contaminated with Hazardous Substances, other than those emitting odors, shall include Site grading, capping with a permeable soil cover, excavation, dredging, and/or consolidation for all areas containing Hazardous Substances at concentrations above established action levels, and development of Institutional Controls for all areas containing Hazardous Substances at greater than background levels to ensure the long-term effectiveness of the remedial action..."

PDI Task S-1 was implemented to determine the extent of Hazardous Substances in soil in order to support the design of the permeable cover and the development of Institutional Controls. The objectives of PDI Task S-1 were therefore to define areas of the Site containing Hazardous Substances:

a) At or above Consent Decree action levels; and,

b) Above background levels but below action levels.

The data needs and methodology and the results of Task S-1 are described in the Interim Final Report (Golder, 1990j) and in the Supplemental Report (Golder, 1991l).

The data needs for PDI Task S-1 were based upon a review of the results of the Phase II RI/FS (Stauffer, 1984 and 1985) in relation to the Consent Decree objectives. The data needs which were identified are as follows (Golder, 1989):

Soil Data Need No. 1

The extent of Hazardous Substances at or above action levels in developed parts of the Site.

Soil Data Need No. 2

The extent of Hazardous Substances at or above action levels in undeveloped parts of the Site to the extent that existing data were inadequate, including:

a) arsenic, lead, chromium, and hide residue in undeveloped parts of the Site where there were data gaps in the RI grid;

b) arsenic, lead, chromium, and hide residue in undeveloped parts of the Site where data existed for only one depth interval;

c) arsenic, lead, chromium, and hide residue in off-Site areas where action levels were exceeded at the Site boundary; and,

d) arsenic, lead, chromium, and hide residue in Boston Edison Right-of-Way No. 9.

Soil Data Need No. 3

Hazardous Substances other than arsenic, lead, chromium, and hide residue in all parts of the Site.

Soil Data Need No. 4

The extent of Hazardous Substances at concentrations greater than background levels but less than action levels.

The ROD established action levels for three metals in soil, sediments and sludges. These action levels were 300 ppm arsenic, 600 ppm lead and 1000 ppm chromium (USEPA, 1986a). The background concentrations of these metals, as well as any other Hazardous Substances pursuant to Soil Data Need No. 3, were to be established in order to delineate the appropriate areas for the development of Institutional Controls. The data collected pursuant to Soil Data Needs 1, 2a through 2d, and 3 was used to delineate these areas after the background levels were established. The rationale for the selection of sampling locations, sampling depth intervals and analytical testing is described in Golder (1989).

Soil Data Needs 1, 2b, 2d, 3 and 4 were satisfied by the initial PDI Task S-1 results. However, additional soil samples were required to satisfy Soil Data Needs 2a and 2c. A supplementary borehole program was therefore performed at on-Site and off-Site locations in order to obtain these additional data (Golder, 1991l).

5.9.1.1 Field Program

The initial Task S-1 field program was performed between April 2 and June 14, 1990. The boring locations are shown on Sheets 11-2A through 11-2D. A total of 127 borings were drilled and sampled up to 36-inch depth using a split spoon sampler driven by a small track-mounted drill rig or portable tripod system, or using a stainless steel hand auger. Most of the work was done with the track-mounted drill rig.

At least three, and up to five soil samples were obtained from each boring at the following depth intervals:

a) 0 to 6 inches;

b) 6 to 18 inches;

c) 18 to 36 inches; and,

d) Up to two discreet intervals within 30 inches of the ground surface in soils displaying colors which were associated with high concentrations of metals in the RI/FS.

Unless some visible indication of soil contamination such as staining was noted, samples for full TCL/TAL analyses were composited for the entire 36 inch depth interval. The compositing procedure did not involve rigorous mixing and quartering in order to avoid potential loss of VOC's.

The split spoon samplers were decontaminated between each sampling interval in accordance with the procedure for "Sampling Surface Soils for Chemical Analyses" described in Appendix B of the PDI Task S-1 Interim Final Report (Golder, 1990j). For boreholes where samples for only arsenic, lead and chromium analysis were collected, the procedure included an Alconox wash, tap water rinse, distilled water rinse, trace metal analyses-grade nitric acid rinse, and a final distilled water rinse. At boreholes where soil samples for TCL/TAL analyses were collected, the foregoing procedure was supplemented with a final HPLC-grade methanol rinse (which was allowed to air dry) and a distilled water rinse. Further details concerning the sample handling and Chain of Custody procedures are described in the PDI Task S-1 Interim Final Report (Golder, 1990j) and in the QAPjP contained in Volume 2 of the PDI Work Plan (Golder, 1989).

Select samples were split with NUS Corporation, USEPA's oversight contractor. Additional field Quality Assurance/Quality Control (QA/QC) procedures included collection of trip blank samples (for VOC's only), equipment rinsate blanks, field duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples.

Four of the 127 borings were drilled and sampled at off-Site locations in order to obtain soil samples for analysis to determine the range of background concentrations of arsenic, lead and chromium in the Site area. Samples of Glacial Till, imported fill, Outwash Sand and peat were obtained from the borings. The boring locations are shown on Figure 11 of the PDI Task S-1 Interim Final Report (Golder, 1990j).

The supplementary borehole program to obtain the additional information to satisfy Soil Data Needs 2a and 2c was performed between November 5 and 8, 1990. The secondary boring locations are shown on Sheets 11-2A through 11-2D. The on-Site borings were located north of the East and West Hide Piles, north of the East-Central Hide Pile, south of the South Hide Pile and along the Boston Edison Right-of-Way No. 9. The off-Site borings were located along the west edge of the Site, and along the MBTA railway. Most of the 34 additional secondary borings were drilled with a small track-mounted drill rig, and soil samples were obtained using a split spoon sampler. A stainless steel hand auger was also used to obtain soil samples at some locations. Procedures for decontaminating the sampling equipment, sample handling, Chain of Custody and other QA/QC procedures were as described for the previous PDI Task S-1 field program.

The PDI Task S-1 and secondary borings were marked in the field and surveyed by SAIC Engineering, Inc. The boring logs are included in the PDI Task S-1 Interim Final Report and the Supplemental Report (Golder, 1990j and 1991l).

5.9.1.2 Laboratory Program

A total of 335 primary soil samples were obtained for laboratory analyses from the PDI Task S-1 borings and a further 98 primary soil samples were obtained from the 34 additional secondary borings. Trip blanks (for VOC's only), equipment rinsate blanks, field duplicates, and matrix spike/matrix spike duplicate samples were also collected at a minimum frequency of 1 per 20 primary samples. The primary samples were analyzed in the laboratory as follows:

Laboratory Analysis	No. of Primary Samples Tested		
	PDI Task S-1	Supplemental Program	Total
Arsenic, Lead and Chromium	335	98	433
Hide Residues	303	98	401
Target Compound List (TCL)			
VOC's	22	--	22
Semivolatile organics	22	--	22
Pesticide/PCBs	22	--	22
Target Analyte List (TAL)			
Metals	22	--	22
Total	726	196	922

Analyses for arsenic, lead and chromium in soil were performed according to Level III analysis using SW-846 methods (USEPA, 1986b). This level of analysis is considered sufficient to support the remedial cover design. TCL/TAL samples were analyzed according to Level IV CLP-RAS methods. The CLP data report packages were validated independent of the analytical laboratory in accordance with EPA Region I guidance documents for data validation (USEPA, 1988 and 1989b). Level IV analyses with data validation is considered necessary to provide defensible data regarding the potential presence of Hazardous Substances and to document background concentrations of Hazardous Substances other than arsenic, lead and chromium.

Hide residue in the soil samples was identified by microscopy in accordance with the "Procedure for Laboratory Identification of Hide Residue in Soil" (Golder, 1990j). The procedure required binocular microscopic examination of soil samples for the presence of hair fibers which were used as indicators of the presence of hide residue. It was found that hair fibers could be distinguished from root fibers much more reliably in oven-dried samples than in samples at natural water content.

The laboratory test results are presented in the PDI Task S-1 Interim Final Report and the Supplemental Report (Golder, 1990j and 1991l).

5.9.1.3 Extent of Hazardous Substances in Soil

The results for arsenic, lead, chromium and hide residue analyses are shown on Sheets 11-2A through 11-2D. These drawings show the extent of arsenic, lead, and chromium above Consent Decree action levels, hide piles as shown in the Consent Decree and hide residue detected in soil samples within 36 inches of the ground surface. This information was used to interpret the limits or extent of remediation for soil.

Hide residue was detected in soil samples at several locations where arsenic, lead and chromium were below Consent Decree action levels, especially in the developed area at the intersection of Commerce Way and Atlantic Avenue, and along the Boston Edison Right-of-Way No. 9 (see Sheets 11-2A, 11-2C, and 11-2D). Hide residue and/or arsenic, lead and chromium above Consent Decree action levels were detected in many of the secondary borings along the Boston Edison Right-of-Way No. 9 and also in several of the off-Site secondary borings. Arsenic, lead or chromium were also detected above Consent Decree action levels in areas west of the Site and south of the Site along the MBTA railway.

Background concentrations for arsenic, lead and chromium were determined to be 25 ppm, 85 ppm and 23 ppm, respectively (Golder, 1990j). Concentrations of these metals are below background in most of the area east of Commerce Way, but most of the test results are above background west of Commerce Way.

The results of the TCL/TAL analysis for other Hazardous Substances in soil are described in the PDI Task S-1 Interim Final Report (Golder, 1990j). TAL metals were detected above background levels over much of the Site west of Commerce Way. Excluding arsenic, lead and chromium, the most widespread metals were zinc, copper, barium, cobalt, mercury, vanadium, and iron.

Several TCL organic compounds were detected above background concentrations. The TCL VOC's which were above background concentrations included acetone along Atlantic Avenue and toluene just south of the East Hide Pile. Several TCL semi-volatile organic compounds, a pesticide (4,4'-DDE), and a PCB compound (Aroclor-1254) were also detected in the PDI soil samples. During the RI/FS, benzene, toluene, and methylene chloride were detected in soil samples at concentrations up to 275,000 ppb, 13,000 ppb, and 2,800 ppb, respectively (Stauffer, 1984 and 1985).

5.9.2 Wetlands and Surface Water Sediments

The remedial action for wetlands and surface water sediments is described in the ROD, the Consent Decree and the RDAP (USEPA 1986a, 1989a). The remedy comprises covering in place potentially odorous sediments containing arsenic, lead, or chromium at or above Consent Decree action levels, including culverting of man-made drainage swales and ditches. Sediments containing arsenic, lead, or chromium at or above Consent Decree action levels without the potential to release odors, are to be dredged.

The Consent Decree objectives for the PDI which are directly applicable to wetlands and surface water sediments, as stated in the RDAP, are as follows (USEPA, 1989a):

> "(c) An investigation to define the horizontal and vertical extent of sediments contaminated with Hazardous Substances in the Site ponds and surface water drainage areas (e.g. streams, ditches, swales) and to establish the area and depth of dredging necessary to provide adequate protection of public health and the environment."

> "(e) Treatability studies for Site surface waters to be treated prior to discharge to groundwater or to surface waters beyond the limits of dredging."

In addition, the following PDI objective was to be addressed for surface water and sediments:

> Evaluate the wetlands between the East and West Hide Piles to assess its current utility and provide input to the Remedial Design in order to remediate and revitalize the wetland.

The following PDI Tasks were therefore implemented to support the remedial design for Hazardous Substances in

Wetlands and Surface Water Sediments (Golder, 1989):

Task SW-1	Extent of Hazardous Substances in Wetlands and Surface Water Sediments;
Task SW-2	Surface Water Treatability; and,
Task SW-3	Wetlands Evaluation.

The results of these PDI Tasks are presented in the Interim and/or Interim Final Reports by Golder (1990k, 1990l, and 1991m), and by Normandeau Associates Inc. (1990). These reports should be consulted for detailed information. The results of Task SW-1 are summarized in the following sections. The extent of Hazardous Substances in the wetland between the East and West Hide Piles was included in PDI Task SW-1. Surface water treatability is discussed in Section 5.10. The purpose of PDI Task SW-3, Wetlands Evaluation, did not include the identification of Hazardous Substances and the results are therefore not included in this section. The wetlands are described in Section 5.5.4.

The results and conclusions of the RI were reviewed and the following data needs were identified for Task SW-1 in order to satisfy the Consent Decree objectives (Golder, 1989):

1. Extent of hide residue in surface water drainage areas;

2. Horizontal and vertical extent of arsenic, lead, and chromium in surface water drainage areas beyond the extent of hide residue;

3. Horizontal and vertical extent of Hazardous Substances other than arsenic, lead, and chromium in surface water drainage areas; and,

4. Extent of Hazardous Substances in soil abutting surface water drainage areas.

The rationale for addressing these data needs is described in the Pre-Design Work Plan. Sampling and analysis was required in order to determine the extent of Hazardous Substances in sediments in all surface water drainage areas such as ponds, wetlands, streams and drainage ditches. The highest concentrations of Hazardous Substances were expected to occur in fine-grained sediments which tend to adsorb more metals and organic compounds than coarse-textured sediments. Sediment sample locations were located at approximately 250 foot intervals in stream channels west of Commerce Way. Several locations east of Commerce Way were also sampled to determine if Hazardous Substances were present. Sediment sample locations in Wetland 1C between the East and West Hide Piles were spaced at less than 250 feet because Hazardous Substances were expected to be present in this wetland.

Surface water sediment data need No. 4 was addressed in PDI Task S-1 Extent of Hazardous Substances in Soil (Golder, 1990j and 1991l). Definition of the extent of Hazardous Substances in soils abutting surface water bodies was required in order to assess the possibility of permeable cover erosion by overland flow and flooding, and to design the permeable cover to minimize such erosion.

5.9.2.1 Field Program

Sediments in the streams and wetlands were sampled at 107 locations between April 4 and June 13, 1990. Replacement samples for mercury analysis were also collected at three locations in July 1990. Additional samples were collected from Wetland 3B and Wetland 8 on June 24 and 25, 1991. The sediment sample locations are shown on Sheets 11-2A through 11-2D. Twenty-three of these sample locations were in stream channels, and 91 were located in or adjacent to ponds or wetlands. At each stream channel location, three boreholes were drilled across the channel in order to collect samples over the stream bed width. At the ponds and wetlands, sediment samples were collected from only one borehole. A boat was used to obtain pond sediment samples.

Most of the sediment samples were collected by advancing a hand auger through a 4-inch diameter steel casing. The casing was required to keep the borehole open while the auger was withdrawn and decontaminated before obtaining the next sediment sample. A small track-mounted drill rig which was equipped to drive a split spoon sampler was used to collect some of the sediment samples from the wetlands. A portable tripod system was also used to drive a split spoon sampler at several locations where coarse-textured sediments could not be sampled with the hand auger.

The three borings were sampled in the stream channel locations in order to assess lateral variations in the extent of Hazardous Substances. One of these borings was located on centerline of the channel and the other two borings were located on each side of centerline depending on the stream channel characteristics. Preference was given to lateral areas which appeared to have more fine-textured sediments.

Samples were collected from each borehole at depth intervals below the sediment/water interface of 0 to 6, 6 to 12, 12 to 18, 18 to 27, and 27 to 36 inches or until sampler refusal. Very soft, fine-textured surface sediments could not be recovered with the sampler at several locations and when this occurred, separate samples were collected by scooping the surface sediments directly into the sample jar. Several boreholes were terminated at less than 36-inch depth because bedrock was encountered.

The borehole logs are included in the Task SW-1 Interim Final Report which also contains the procedures for decontaminating the sampling equipment, Chain of Custody forms, and the QA/QC procedures (Golder, 1990l). The results for the June 1991 samples are given in Appendix 13-A of this report.

The borehole locations were marked and subsequently surveyed by SAIC Engineering, Inc.

5.9.2.2 Laboratory Program

A total of 606 primary sediment samples were obtained from streams and wetlands for laboratory analyses. Trip blank samples (for VOC's only), equipment rinsate blanks, field duplicates and matrix spike/matrix spike duplicate samples were also collected at a minimum frequency of 1 per 20 primary samples. The primary samples were analyzed in the laboratory as follows:

Laboratory Analysis	No. of Primary Samples Tested
Arsenic, Lead and Chromium	606
Hide Residues	437
Target Compound List (TCL)	
VOC's	17
Semivolatile organics	17
Pesticide/PCB's	17
Target Analyte List (TAL)	
Metals	17
Methyl Mercury	5
Total	1,116

The analytical methods included SW-846 for arsenic, lead, and chromium; CLP-RAS for TCL/TAL analysis, and a method for methyl mercury provided by the USEPA oversight contractor, NUS Corporation. Identification of hide residue by microscopy methods was performed in accordance with "Procedure for Laboratory Identification of Hide

Residue in Soil" (Golder, 1989). Laboratory QA/QC procedures are described in the QAPjP (Golder, 1989).

Five sediment samples were analyzed for methyl mercury in accordance with the analytical method provided by NUS. The sediment samples were obtained from streams or wetlands where mercury was detected in nearby soils during the RI. However, high matrix interference resulted in poor chromatographic resolution and no useable data were obtained.

5.9.2.3 Results

The laboratory test results are tabulated in PDI Task SW-1 Interim Final Report and Appendix 13-A of this report, and the results for arsenic, lead, chromium and hide residue analyses are shown on Sheets 11-2A through 11-2D. This information was used to determine the limits of remediation for soil and surface water sediments.

Hide residue was detected in sediment samples from several locations where arsenic, lead and chromium were below Consent Decree action levels. Other locations were identified where hide residue was not detected in the sediment samples, but arsenic, lead and chromium concentrations were above Consent Decree action levels. Arsenic, lead and/or chromium in sediment samples exceed Consent Decree action levels in the following locations (see Sheets 11-2A through 11-2D):

- The drainage ditches along New Boston Street;
- The Chromium Lagoons and the drainage ditch adjacent to the Chromium Lagoons;
- The southern half of the wetland between the East and West Hide Piles;

- The channel which drains the wetland between the East and West Hide Piles into the Aberjona River;
- An inlet of the wetland just north of the East Hide Pile; and,
- A wetland northeast of the intersection of Commerce Way and Atlantic Avenue.

Hide residue was detected in sediment samples from all of the foregoing localities and also in:

- The north half of the wetland between the East and West Hide Piles;
- Wetland 8 in the Boston Edison Right-of-Way No. 9 just west of the MBTA railway;
- Wetland 3B east of the intersection of Commerce Way and Atlantic Avenue; and,
- The drainage ditch along Interstate 93 in the northeast corner of the Site.

Chromium was detected in sediment samples above Consent Decree action level in the drainage channel south of the Chromium Lagoons.

The results of TCL/TAL analyses for other Hazardous Substances in sediment samples are described in the PDI Task SW-1 Interim Final Report (Golder, 1990l). A variety of TAL metals were detected over much of the Site. Fourteen of the 23 TAL metals were detected at higher concentrations in the sediment samples from the Chromium Lagoons than from other parts of the Site. TCL VOC's which were detected in sediment samples included benzene, toluene, chlorobenzene, trichloroethene, trans-1,2-dichloroethene, acetone and methylene chloride. TCL semi-volatile organic compounds detected included polynuclear aromatic hydrocarbons (PAH's) in the Chromium Lagoons and the drainage ditch along New Boston Street, and various phthalate compounds over widespread areas of the Site. A pesticide (4,4'-DDE) was detected in the Chromium Lagoons and a PCB (Aroclor-1248) was detected in the southern half of the wetland between the East and West Piles.

The sample locations for surface water treatability testing (PDI Task SW-2), which were selected on the basis of the Task SW-1 data, were reported in the Task SW-1 Interim Report (Golder, 1990l).

5.9.3 Groundwater

The Consent Decree specifies the remedy for groundwater in the RDAP as follows (USEPA, 1989a):

> "The remedial action for groundwater shall include an interim remedy of pumping and treating "hot spot" areas of groundwater contamination and the concurrent development and implementation of Groundwater/Surface water Investigation Plan (GSIP) to evaluate Site-wide groundwater and surface water contamination...Settlers shall design and implement an interim groundwater remedy that shall consist of several interceptor/ recovery wells located to capture the identified plumes of Hazardous Substances (benzene and toluene) migrating in groundwater, construction of a treatment system, and operation and maintenance of these remedial components until the appropriate performance standards are achieved...Settlers shall pretreat recovered groundwater to control odors and to remove dissolved or suspended Hazardous Substances, and shall subject the recovered groundwater to air stripping to remove volatile Hazardous Substances. Settlers shall during Remedial Design identify appropriate performance standards for groundwater and effluent water quality and shall submit these proposed performance standards to EPA and the Commonwealth for review and approval. The treated effluent shall be discharged via a subsurface leaching pit to be located on-Site in an upgradient portion of the aquifer."

The RDAP outlined the work scope for the PDI Groundwater Investigation to support the design of the groundwater remedy as follows:

> "(g) investigation to more accurately characterize the "hot spot" areas of benzene and toluene contamination, to assess the treatability of groundwater, and to provide data to be used in the development of operating parameters such as pumping rates, interceptor well locations, recharge area location, and period of system performance. Included in these groundwater investigations shall be Settlers proposed performance standards for effluent water quality."

The GSIP is being conducted by Roux Associates, Inc. along with a group of subconsultants for the ISRT and the results of the Phase I investigation are reported in Roux (1991a). The scope of work for the Phase II GSIP RI is described in Roux (1991b), but the results were not available for inclusion in this report.

The following PDI Tasks were implemented to address the groundwater objectives in conjunction with the existing data from the RI/FS and the additional data to be obtained from the Phase I GSIP RI (Golder, 1989):

Task GW-1	Plume Delineation;
Task GW-2	Hydrogeologic Characterization for the Extraction/Recharge System; and,
Task GW-3	Groundwater Treatability.

The extent of Hazardous Substances in groundwater as determined by Task GW-1 are summarized in the following sections. The results of Task GW-2 are described in Section 5.8, Physical Hydrogeology. Groundwater treatability studies are discussed in Section 5.10. The Interim Final Report for Task GW-1 and the Phase I GSIP RI should be consulted for further information (Golder, 1991c; Roux, 1991a).

Existing data, including the RI and the USEPA and the Massachusetts Department of Environmental Protection (MDEP) project files, were reviewed to assist in developing the PDI groundwater tasks and data needs. The following data needs were identified for PDI Task GW-1 Plume Delineation (Golder, 1989):

1. The areal extent and saturated thickness of the unconsolidated deposits;

2. The types and concentrations of Hazardous Substances in the groundwater "hot spots"; and,

3. The extent of Hazardous Substances.

The foregoing data needs were addressed by five specific subtasks which were as follows (Golder, 1989):

Subtask 1	Determination of aquifer thickness and boundaries;
Subtask 2	Installation of Pre-Design Phase 1 monitoring well clusters;
Subtask 3	Sampling of Pre-Design Phase 1 monitoring well clusters;
Subtask 4	Installation of Pre-Design Phase 2 monitoring well clusters; and,
Subtask 5	Sampling of Pre-Design Phase 2 (and Phase 1) monitoring well clusters.

The methodology and results of Subtasks 1, 2 and 4 which are relevant to hydrogeology are discussed in Section 5.8, Physical Hydrogeology. The results of Subtasks 2 and 4 which are relevant to the extent of Hazardous Substances in groundwater are summarized in the following sections. The Interim Final Report for PDI Task GW-1 Plume Delineation, the Arsenic Pit/Chromium Lagoon Investigation, and the Phase I GSIP RI should be consulted for further information (Golder, 1991c, 1991d; Roux, 1991a).

5.9.3.1 Field Program

The Phase I GSIP RI resampled existing RI/FS monitoring wells along with three new GSIP monitoring wells in March, 1990. Based upon these results, fourteen PDI Phase 1 monitoring wells were installed at eight locations downgradient of the Site. These wells were identified as OW-23 to OW-27, OW-29, OW-30 and OW-33. With the exception of OW-23 and OW-29, a two-well cluster was installed at each monitoring well location. Shallow wells were identified with an "A" suffix. The well clusters were installed where the saturated thickness of the Outwash Sand was more than 30 feet. The well screens were located in the most permeable portion of the Outwash Sand as indicated by visual inspection of the sediments or in zones which exhibited high concentrations of VOC's by screening with an organic vapor detector.

During Subtask 3, the Phase 1 monitoring wells OW-23 through OW-27, OW-29 through OW-33 and the City of Woburn water at the decontamination pad were sampled from June 4 to 6, 1990. Monitoring wells OW-31 and OW-32 which are located at the base of the East and West Hide Piles, respectively, were also sampled.

Prior to sampling, the total well depth and depth to water were measured, and the volume of standing water in each monitoring well was calculated. Each of the wells was then purged to remove a minimum of three volumes of standing water from the well before sampling.

The groundwater samples were collected with a Teflon bailer. The pH, temperature, specific conductance, and depth to water were measured in the field. Samples collected for dissolved metals analysis were field-filtered and then preserved with nitric acid.

Seven Phase 2 monitoring wells, identified as OW-36 to OW-42 were installed to obtain better definition of the previously identified benzene and toluene "hot spots".

The following 25 wells at 23 locations were sampled during the Subtask 5 (Phase 2) sampling of monitoring wells:

PDI Phase 1 Wells	PDI Phase 2 Wells	GSIP Wells	RI Wells
OW-24A	OW-36	OW-21	OW-9
OW-24B	OW-37	OW-22	through
OW-31	OW-38	OW-28	OW-13
OW-32	OW-39		OW-16
	OW-40		OW-17
	OW-41		OW-18&18A
	OW-42		OW-19&19A

The Phase 2 groundwater samples were collected during October 15 to 18, 1990. The wells were purged before sampling as for Subtask 3. The samples for VOC analysis were collected in 40-ml glass vials preserved with hydrochloric acid except for the samples from OW-16, OW-31 and OW-38. These samples were not preserved because the hydrochloric acid caused effervescence of the sample, which could result in loss of VOC's. Samples collected for total metals analyses were placed in 1 liter plastic bottles, preserved with nitric acid, and kept cool. Samples collected for dissolved metals analysis were field filtered and then preserved with nitric acid.

QA/QC samples were also collected as part of the well sampling programs for Subtasks 3 and 5.

Eleven additional monitoring wells were installed in March and April, 1991, in order to assess if the Arsenic Pit and Chromium Lagoons were acting as source areas for metals in groundwater. The new monitoring wells were installed in accordance with the protocol given in the work plan for the task (Golder, 1991a). The wells were sampled in conjunction with 11 pre-existing wells adjacent to the Arsenic Pit and Chromium Lagoons. Samples were collected for total and dissolved TAL metals, total organic carbon, chemical oxygen demand, ammonia, total Kjeldahl nitrogen, and total dissolved solids. Redox potential, pH, temperature, and specific conductance were measured in the field.

5.9.3.2 Laboratory Program

The groundwater samples from Subtask 3 Sampling of Phase 1 Monitoring Wells were analyzed for TCL VOC's, semi-volatile organic compounds, pesticides and polychlorinated biphenyls (PCB's), and for total and dissolved TAL metals. The samples were analyzed by Contract Laboratory Program - Routine Analytical Services (CLP-RAS) methods.

The groundwater samples from Subtask 5 Sampling of Phase 2 Monitoring Wells were analyzed for TCL VOC's, and for total and dissolved TAL metals. The samples were not analyzed for pesticide/PCB's or for semi-volatile organic compounds because no pesticides/PCB's were detected in the Subtask 3 groundwater samples, and only low concentrations of semi-volatile organic compounds were detected on-Site during the Subtask 3 sampling program.

The analytical test results for both sets of groundwater samples are included in the Interim Final Report for Task GW-1 Plume Delineation, together with Chain of Custody documentation and data validation (Golder, 1991c).

Total and dissolved TAL metals samples from the Arsenic Pit and Chromium Lagoon investigation were analyzed by Level IV CLP-RAS methods. The remaining general water quality parameters were analyzed in accordance with Level III USEPA Water and Wastewater methods (USEPA, 1983).

5.9.3.3 Extent of Hazardous Substances in Groundwater

The test results for groundwater samples from PDI Task GW-1 and from the Phase I GSIP RI were used to delineate the extent of Hazardous Substances in groundwater (Golder, 1991c, 1991d and Roux, 1991a). This information is summarized in the following sections. The references should be consulted for further details.

Distinct plumes of benzene/toluene, and arsenic/chromium were inferred from the results of PDI Task GW-1 and the Phase I GSIP RI. The highest benzene concentrations of 48,000 ppb and 36,000 ppb occurred in samples from OW-31 during the Phase 1 and Phase 2 groundwater sampling program. The highest toluene concentration of 29,000 ppb occurred in samples from OW-16 which is adjacent to the East Central Hide Pile. The highest dissolved arsenic concentration detected was 2,860 ppb in a sample from OW-16, and the highest dissolved chromium concentrations was 449 ppb in OW-37.

Other Hazardous Substances were identified on-Site by the analytical test results from the PDI Task GW-1 and the Phase I GSIP RI. Nine TCL VOC's and semi-volatile organic compounds other than benzene and toluene were detected.

The highest concentration for these organic compounds was phenol at 430 ppb in OW-27A. Concentrations of the other organic compounds on-Site was 64 ppb or less. No PCB's or pesticides were detected in the Phase 1 PDI or Phase I GSIP RI groundwater samples.

The extent of hazardous substances in groundwater will be addressed further in Part II of this report.

5.9.4 Air

Two Consent Decree objectives are applicable to air. The first objective, as stated in the RDAP, is as follows (USEPA, 1989a):

> "A baseline investigation to establish an effective air monitoring program and to determine acceptable on-Site and off-Site air quality standards for hazardous volatile compounds and/or other odorous compounds and dust relative to planned grading, consolidation, excavation, dredging, groundwater treatment and capping activities."

The second objective for air is related to treatability of gas emissions from the East Hide Pile and is a requirement of the Site Monitoring Program described in the RDAP which will be used...

> "to provide data to assist in the development of the temporary gas treatment system to be operated at the East Hide Pile."

The PDI Tasks which were implemented to address the objectives for air are as follows (Golder, 1989):

Task A-1 Baseline Air Survey; and,

Task A-2 Gas Treatability.

The data needs for these two tasks were based upon a review of the existing data in relation to the Consent Decree objectives.

With reference to Hazardous Substances in air, data need No. 3 for PDI Task A-1 Baseline Air Survey was (Golder, 1989):

> "Determine baseline concentrations of hazardous volatile compounds, odorous compounds, dust, and arsenic, lead, and chromium in dust at select locations."

The two data needs for PDI Task A-2 Gas Treatability were as follows:

1. The types and concentrations of hazardous volatile compounds and odorous compounds present in gas in the East Hide Pile; and,

2. The emission rate of gas from the East Hide Pile.

The results of the PDI Task A-1 are discussed in the following sections in relation to Hazardous Substances in air. The results of Task A-2 are discussed in Section 5.10.

PDI Task A-1, Baseline Air Survey, required four rounds of air sampling and analytical testing to address data need No. 3. The sampling rounds were spaced over a one year period in order to assess seasonal effects on baseline air quality. The air samples were obtained in May, August, and November, 1990, and February, 1991. The twelve air sampling locations were based upon the results of air dispersion modeling conducted during the RI/FS using regional meteorological data together with the historical locations of odor complaints (Golder, 1989). Details of the air sampling procedure, chain of custody and QA/QC procedures are described in the Interim Reports and the PDI

Field Sampling Plan (Golder, 1989). The air samples were collected over a 24-hour period. Samples to be analyzed for TCL VOC's, methane and reduced sulfur compounds were collected in 15-liter Summa passivated canisters. Dust samples were collected on filter cassette cartridges using a programmable personal sampling pump. Meteorological data, including wind speed and direction, relative humidity, temperature, and barometric pressure were recorded by the Site weather station during sampling.

The samples were analyzed in accordance with the procedures and analytical methods described in the PDI Field Sampling Plan and the QAPjP (Golder, 1989). The test results are included in the Interim and Interim Final Reports (Golder, 1990m, 1990n, 1991n, 1991o) and are summarized herein.

No reduced sulfur compounds or methane were detected at any of the sampled locations. The detection limits were 20 ppb (by volume) and 8 ppb, respectively. TCL VOC's which were detected included Freon 11, Freon 113, acetone, methylene chloride, 2-butanone, 1,1,1-trichloroethane, benzene, toluene, xylenes, and 1,2,4-trimethylbenzene. Freon 11 and 2-butanone were the most frequently detected compounds, and were also present at higher concentrations than other TCL VOC's (up to 78 ppb and 56 ppb, respectively). Total nuisance dust concentrations ranged from less than 200 to 1544 micrograms per cubic meter with an arithmetic average of 334 micrograms per cubic meter, and a standard deviation of 336 micrograms per cubic meter. Lead was not detected in any of the samples. Arsenic was detected in the fourth quarter samples, but are suspected to be in error. Chromium was detected in the second and third quarters at concentrations ranging up to 1.387 micrograms per cubic meter. Additional particulate sampling is being performed at this time, but the results are not yet available.

5.10 TREATABILITY STUDIES

A variety of treatability studies were carried out on surface water, groundwater, and soil gases emitted from the East Hide Pile. These treatability studies supported design of treatment systems for disturbed surface water during dredging of wetlands and streams, the interim groundwater remedy, and the remedy for the East Hide Pile.

5.10.1 Surface Water Treatability

PDI Task SW-2, Surface Water Treatability, was implemented in order to address treatment of the water in streams and wetlands which might be disturbed during Site remediation by the removal of Hazardous Substances, and the pore water draining from dredged sediments which contain Hazardous Substances.

The data needs for PDI Task SW-2 were based upon a review of RI/FS data in relation to the Consent Decree objectives (Golder, 1989). The primary data needs are:

1. To determine the applicable treatment requirements;

2. To identify the Hazardous Substances which might be present in disturbed surface water due to excavating (dredging) sediments, or draining of pore water from excavated sediments, including entrained and dissolved substances; and,

3. To assess the treatability of the disturbed surface water.

The data needs and rationale are described further in the Pre-Design Work Plan (Golder, 1989). PDI Task SW-2 was divided into two phases. The objective of the initial phase was to determine if Hazardous Substances become dissolved or entrained in disturbed surface water and/or sediment pore water during excavation. The objective of the second phase, if required, was to perform treatability studies to assess what treatment may be necessary.

5.10.1.1 Field Program

Phase 1

Field sampling and sample processing were performed during January 22 to 24, 1991. Samples of pore water and disturbed surface water were collected from five stream and pond locations. These sampling locations were proposed in the PDI Task SW-1 Interim Report on the Extent of Hazardous Substances in Wetlands and Surface Water Sediments (Golder, 1990k). Approval by the Agencies included a reduction from the ten sample locations proposed in the Pre-Design Work Plan to five sample locations due to the limited number of areas where dredging would be involved to construct the Consent Decree remedy. The samples were obtained from the following locations (Golder, 1991p):

- Standing water at the north end of the New Boston Street drainway;
- The northern half of the West Chromium Lagoon;
- The Atlantic Avenue drainway on Boston Edison Right-of-Way No. 9;
- The southwestern portion of Wetland 1C; and,
- The southern half of Wetland 3B.

Sediment samples were collected by shovel from the two shallow stream locations and by Eckman dredge at the three pond locations. Samples of surface water were also collected at each location. The water bodies were frozen to a depth of four to eight inches but the ice did not extend completely to the water/sediment interface at any of the sample locations. All sample handling equipment was decontaminated prior to sampling in accordance with procedures described in the Field Sampling Plan in the Pre-Design Work Plan (Golder, 1989).

Phase 2

Non-settleable Hazardous Substances were detected in the Phase 1 samples (see Section 5.10.1.2). Therefore, Phase 2 testing was necessary in order to evaluate suspended solids removal by sedimentation processes. Samples were collected from two locations considered representative of the conditions encountered during Phase 1 testing. Separate sediment and surface water samples were collected at each location and shipped to a treatability laboratory (Golder, 1991q).

5.10.1.2 Laboratory Program

Phase 1

The collected sediment and water samples were taken to the Site trailer for processing to prepare surface water samples for analytical testing. Pore water samples were prepared by placing the sediment in a Buchner funnel, applying a slight vacuum and allowing the pore water to drain into a polypropylene Erlenmyer flask. Aliquots of the extracted pore water were then transferred to sample jars for analytical testing for total suspended solids (TSS) and total arsenic, lead, and chromium. The remaining pore water was filtered through a 0.45-micron membrane filter into sample jars for dissolved arsenic, lead, and chromium analyses.

Samples of "disturbed" surface water to simulate the surface water produced by excavation (dredging) were prepared in one liter glass reaction vessels. Approximately 200 cubic centimeters (cc) of sediment was placed in the reaction vessel with 750 cc of surface water. The mixture was shaken for one minute and allowed to settle for one hour. The supernatent liquid was decanted into sample jars for analytical testing for TSS and total arsenic, lead and chromium. Samples for dissolved arsenic, lead, and chromium in the supernatent were obtained by filtering through a 0.45-micron membrane filter into sample jars. The remaining supernatent was retained to produce a composite sample of disturbed surface water for additional tests. The additional tests on the composite sample included TCL organic compounds and total and dissolved TAL metals. The composite sample was also submitted for analysis of total dissolved solids (TDS), TSS, ammonia, total Kjeldahl nitrogen (TKN), nitrate/nitrite, chemical oxygen demand (COD), 5-day carbonaceous biochemical oxygen demand (BOD), total organic carbon (TOC), total inorganic carbon (TIC), alkalinity, orthophosphate, sulfide, and sulfate.

The samples were analyzed by USEPA "Wastewater" and SW-846 methods (USEPA, 1983, 1886b). The laboratory QA/QC procedures were in accordance with the QAPjP (Golder, 1989). Further details and the test results of the laboratory program are described in the PDI Task SW-2 Interim Report on Surface Water Treatability (Golder, 1991p).

Phase 2

Non-settleable Hazardous Substances were detected in the Phase 1 samples. Therefore, Phase 2 testing was necessary in order to evaluate suspended solids removal by sedimentation processes. Because polymers and chemicals such as ferric chloride can enhance settling of suspended solids, they were included in the treatability testing program. The evaluation of settling was performed by conducting jar tests and column settling tests. The column settling tests utilized vertical test columns which allowed settling to be evaluated as a function of both time and depth (Golder, 1991q).

Treatability samples were prepared by mixing fresh aliquots of the sediment and surface water samples just prior to testing. Jar tests included evaluation of enhanced flocculuation using ferric chloride and polymer. After optimum dosages of ferric chloride and polymer were evaluated by the jar tests, three separate column settling tests were performed using untreated influent, ferric chloride-treated influent, and polymer-treated influent. A fourth set of settling tests were performed to simulate the high-pH metals precipitation process incorporated into the design of the physical-chemical groundwater treatment system.

The treatability testing effluent samples were analyzed according to the same procedures as the Phase 1 test samples.

5.10.1.3 Surface Water Treatability Results

The results and conclusions of the Surface Water Treatability testing are summarized in this section. The PDI Task SW-2 Interim and Interim Final Reports should be consulted for further information (Golder, 1991p, 1991q).

Phase 1

Detectable concentrations of arsenic and lead were present in both filtered and unfiltered samples of disturbed surface water and sediment pore water from the five areas sampled which might be dredged as part of the Consent Decree remedy for streams and wetlands. Chromium was not detected in filtered samples at any of the five sampled locations. However, chromium was present in the unfiltered samples. Toluene (7 ppb) was the only TCL organic analyte detected in the composite sample. A variety of TAL metals were detected, and detectable concentrations of all conventional analytes, except sulfide, were present.

The analytical test results for disturbed surface water and sediment pore water were compared with the ambient water quality criteria presented in the 30% Design Report (Golder, 1990i) in order to identify possible water treatment requirements before disturbed surface water is discharged to streams. The total (unfiltered) metals samples exceeded the acute (short-term) water quality criteria for arsenic, cadmium, chromium, copper, iron, lead, and mercury. Surface water treatability studies (i.e., the second phase of PDI Task SW-2) were therefore necessary in order to determine if the Hazardous Substances detected in the unfiltered samples could be removed by physical treatment methods (e.g., settling), or if chemical treatment methods (e.g., coagulation/flocculation) are required.

Phase 2

Gravity settling without coagulant (ferric chloride and ionic polymer) addition was found to be effective in removing over 95 percent of the TSS. Both coagulants increased TSS removal over untreated settling. Coagulants did not improve removal of total arsenic, but coagulants did improve removal of total chromium and lead. High-pH metals precipitation was also found to be effective in removing many types of metals, including arsenic, lead, and chromium.

5.10.2 Groundwater Treatability

The objective of Task GW-3, Groundwater Treatability, was to produce performance data for unit process design and to demonstrate the capability of the proposed system to comply with proposed effluent quality standards. Hazardous Substances of primary concern identified during the RI/FS were VOC's (benzene and toluene), and odorous compounds such as hydrogen sulfide and methyl mercaptan (Stauffer, 1985). The treatment methods selected in the ROD for groundwater remediation were hydrogen peroxide oxidation for odor control and air stripping for removal of VOC's (USEPA, 1986a). In general, the RDAP (USEPA, 1989a) requires that:

> "...Settlers shall pretreat recovered groundwater to control odors and to remove dissolved or suspended Hazardous Substances, and shall subject the recovered groundwater to air stripping to remove volatile Hazardous Substances...."

The data needs and methodology for PDI Task GW-3 are described in the Pre-Design Work Plan (Golder, 1989). The data needs for groundwater treatability were based upon the Hazardous Substances identified in the RI/FS and the requirements of the ROD and the Consent Decree.

The methods and results of Task GW-3 to date are summarized below. The discussion is divided between two approaches to groundwater treatment: a physical-chemical system and an alternative biological treatment system (The Advent Group, Inc., 1991).

5.10.2.1 Physical-Chemical Treatment

Groundwater samples were obtained for initial treatability testing in late June, 1990 from observation wells OW-16 and OW-17. These wells are located in the upgradient and downgradient ends, respectively, of the inferred benzene-toluene plume. Observation well OW-16 is located about 200 feet north of the intersection of Commerce Way and Atlantic Avenue. Observation well OW-17 is located about 200 feet south of the Boston Edison Right-of-Way No. 9 near the east edge of Halls Brook Holding area. These two wells were selected for initial treatability sampling on the basis of the latest data available from the Phase I GSIP RI at that time. This data indicated that OW-16 had the highest concentrations of toluene and total sulfide, and that OW-17 had the highest concentrations of benzene. Consistent with the PDWP, the initial groundwater treatability samples were collected from the wells exhibiting the highest concentrations of Hazardous Substances so that the groundwater treatability work was conducted for projected "worst-case" influent conditions for benzene, toluene, and odors.

The initial groundwater treatability results were inconclusive and additional Hazardous Substances, other than benzene, toluene and odors addressed in the PDWP, were detected in the groundwater. A Supplementary Work Plan was therefore prepared in November, 1990 for PDI Task GW-3 Groundwater Treatability (Golder, 1990e).

In the Supplementary Work Plan, four composited samples were to be obtained for groundwater treatability testing in order to represent the expected range of groundwater influent characteristics. The four influent samples were designated as samples A, B, C and D, and were obtained from the following observation wells in early December, 1990:

Sample	Source
A	OW-13
B	OW-16, OW-17 and OW-31
C	OW-14 and OW-18

D OW-14, OW-16, OW-17, OW-18 and OW-31

As described in the Supplementary Work Plan (Golder, 1990e), a three-phased approach was used to determine the applicable water treatment processes. The three phases were as follows:

Phase 1 - Initial screening tests (batch tests) to identify appropriate operating conditions for the various unit processes;

Phase 2 - Confirmation testing (batch and continuous flow tests) to confirm the results of Phase 1 and to generate effluent data which can be used to estimate the performance of the full-scale system; and,

Phase 3 - Evaluation of additional treatment processes for removal of arsenic and ammonia.

The treatability tests were performed using equipment commonly used to simulate the unit processes on a bench scale. Phase 1 and Phase 2 tests were performed in the field laboratory at the Site between December 4 and December 21, 1990; and Phase 3 testing was performed at the Jordan, Jones & Goulding, Inc. fixed laboratory in Atlanta, Georgia.

The Phase 1 treatability testing program consisted of the following batch tests:

- Oxidation by hydrogen peroxide;
- Metals precipitation;
- Air Stripping;
- Granular Carbon Absorption;
- Ozonation; and,
- Ion Exchange.

The Phase 2 treatability testing consisted of batch and continuous flow testing in order to simulate the effluent which would be produced by a full-scale system. The sequence of unit processes tested were: oxidation, two stage metals precipitation, air stripping, ozonation, granular carbon absorption and ion exchange.

The results of the first phase (initial screening tests) were presented in an Interim Report (Golder, 1991r). The Interim Report includes a summary of the available groundwater quality data from PDI Task GW-1, Plume Delineation (Golder, 1991c, 1991d), and the Phase I GSIP RI (Roux, 1991a). It also identifies additional unit processes required to treat additional Hazardous Substances not addressed by the Consent Decree.

The results of all physical-chemical treatability testing are summarized in the Interim Final Report (Golder, 1991g). Over 84 percent removal of hydrogen sulfide was achieved by chemical oxidation at a hydrogen peroxide dosage of 50 mg/l and a reaction time of 1 hour. Hydrogen sulfide was also removed by the first-stage metals precipitation and ozonation unit processes. Chemical oxygen demand was removed by both granular activated carbon (GAC) and ozonation at efficiencies of 65 percent and 85 percent, respectively. Arsenic removal was demonstrated to have occurred by several mechanisms. Settling in the first-stage metals precipitation unit was effective when arsenic was in the particulate form. Oxidation was also effective in aiding arsenic precipitation by other mechanisms. Iron coprecipitation also removed arsenic. Benzene and toluene were effectively removed by air stripping and ozonation processes. Acetone was removed by GAC. Various metals were removed by the first-stage metals precipitation process, while other metals were removed by the second-stage process.

The Interim Final Report (Golder, 1991g) should be consulted for more detailed information concerning Hazardous Substances in groundwater, expected influent composition, treatability testing, and treatment plant processes.

5.10.2.2 Biological Treatment

Additional groundwater treatability studies are also being performed at this time to evaluate the feasibility of designing a fluidized bed biological treatment system which might be more efficient than the physical-chemical treatment system (The Advent Group, Inc., 1991).

5.10.3 Gas Treatability

The objectives of PDI Task A-2, Gas Treatability, included the further definition and characterization of Hazardous Substances and odors at the East Hide Pile and determination of their emission rates (Golder, 1989). The data from the gas treatability study was required to evaluate the selected alternatives for the gas treatment system in relation to gas composition and emission rates.

The methodology and results of PDI Task A-2 are presented in the Interim Final Report (Golder, 1990o). Gas samples were collected and emission rates were measured in two sampling rounds in May and August, 1990. Emission rates were measured at existing gas vents (wells) and also by using a flux chamber. Gas samples for analytical testing were collected from the gas vents and from flux chambers. Atmospheric temperature and pressure were recorded at the meteorologic station on-Site during each sampling round.

The recovered gas samples were forwarded to the laboratory for analytical testing in accordance with the Pre-Design Work Plan (Golder, 1989).

The gas samples were analyzed in the laboratory for VOC's, reduced sulfur compounds (including hydrogen sulfide and methyl mercaptan), and methane. The results of the PDI gas treatability studies are presented in the Interim Final Report (Golder, 1990o). The compounds which were detected include benzene, toluene, ethylbenzene, chlorobenzene, dichloro-benzene, methane, and hydrogen sulfide. The most common constituent was methane at concentrations ranging from 5.5 to 240,000 ppm (by volume). Hydrogen sulfide concentrations ranged from 0.027 to 2760 ppm, and traces of the remaining constituents were present from 4.4 ppm to less than the detection limits. The test results indicated that the East Hide Pile gas contained up to 24 percent methane, 0.28 percent hydrogen sulfide, and less than 0.004 percent volatile organics. The remaining 75.7 percent was likely composed of carbon dioxide with smaller amounts of nitrogen and other fixed gases. The range of emission rates was estimated to be between 33 and 63 standard cubic feet per minute (scfm).

5.11 OTHER INVESTIGATIONS

As part of the PDI Site Monitoring Plan (Golder, 1991s), potential settlement of the East Hide Pile was investigated by installation and subsequent monthly surveying of steel rods. The results showed that small heave and settlement movements have been recorded (typically less than 0.03 feet). The absolute movements were small with no apparent pattern and within the range of survey closure errors. Therefore, it was concluded that the East Hide Pile is in settlement equilibrium and no further monitoring is required.

As part of PDI Task S-3, potential off-Site sources of borrow material were evaluated for geotechnical properties and compliance with design criteria given in the RDAP. The results are presented in the Interim Final Report (Golder, 1990p).

5.12 REMEDIAL DESIGN

The Remedial Design has issued a variety of reports (Golder, 1990i, 1991h, 1991i, 1991j, 1991k, 1991m, 1991t, and 1991u) leading up to this 100% Design. Supplemental PDI investigation results for Task S-4, Foundations, were presented in Appendix 8-B of the 60% Design Report (Golder, 1991j) and will also be included in Part II of this report since the work relates to the Groundwater Treatment Plant. Supplemental results for Task SW-1, Extent of Hazardous Substances in Wetlands and Surface Water Sediments, were presented in Appendix 13-A of the 95% Design Report (Golder, 1991m) and are also included in Appendix 13-A of this report.

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INDUSTRI-PLEX SITE LANDOWNERS	
Aero Realty Trust	Janpet Associates
Atlantic Avenue Associates, Inc.	John G. Koster
Atlantic Avenue Trust	Massachusetts Bay Transportation Authority
Boston Edison Company	Nodraer Realty Trust
The Boyd Corporation	Pebco Company
Positive Start Realty	PX Realty Trust
Chestnut Hill Realty Trust	Winter Hill Storehouse, Inc.
Stephen & Adeline Dagata	City of Woburn
Dundee Park Properties	Woburn Industrial Associates, Inc.
Hiro K. & Sunder K. Ganglani	Woburn Redevelopment Authority
Industri-Plex Site Interim Custodial Trust	

SUMMARY OF REMEDIAL INVESTIGATION / FEASIBILITY STUDY - FIELD PROGRAM (1)

PHASE	SOIL (2)	SURFACE WATER (3)	GROUNDWATER		AIR	TOTAL
I	189	10	15 (4)	8 (5)	10 (6)	232
II	860	0	72 (4)	23 (5)	369 (7)	1324
TOTALS	1049	10	87	31	379	1556

(1) From Stauffer, 1984, pp. I-6 through I-11 and Table A.

(2) This column includes test pits, borings and stream sediments on- and off-Site for the RI/FS.

(3) This column includes near surface high- and low-flow surface water samples and leachate samples.

(4) This number represents groundwater monitoring wells including pump test wells.

(5) This number represents piezometers.

(6) Air sampling boreholes for Hydrogen Sulfide, Arsine, Volatile Organics.

(7) Barholes (1/2 inch diameter steel tubes driven to 30 inch depth) and boreholes (PVC gas vents).

Table 5-3

SUMMARY OF REMEDIAL INVESTIGATION / FEASIBILITY STUDY LABORATORY PROGRAM (1)

PHASE	SOIL (2)	WATER (3)	AIR (4)	TOTALS
I	364	25	36	425
II	1094	85	15 (5)	1194
TOTALS	1458	110	119	1619

(1) Total number of samples submitted for analysis. Does not include QA/QC samples or subsamples (e.g., one soil sample analyzed for VOC's and metals). From Stauffer, 1984, pp. I-6 through I-11 and Table A.

(2) This column includes Test Pits, Boreholes, and Stream Sediment Samples. Geotechnical testing and EP Toxicity testing is not included.

(3) This column includes samples of groundwater and surface water.

(4) This column includes air samples from barholes (soil gas probes) and boreholes (PVC gas vents). Industrial hygiene samples not included.

(5) This number excludes the Arthur D. Little Odor analysis program and barhole field screening analyses.

SUMMARY OF PDI - FIELD PROGRAM (1)

PDI Task	No. of Boreholes or Test Pits	No. of Groundwater Monitoring Wells/Piezometers
S-1	161 (2)	-
S-2	17	2
S-3	13 (3)	-
S-4	35	-
GW-1	52 (4)	32 (4)
GW-2	49	28 (5)
GW-3	-	-
SW-1	160	-
SW-2	5	-
SW-3	-	-
A-1	-	-
A-2	-	-
Totals	492	62

(1) Subsurface investigations, from Golder (1990b, 1990b, 1990c, 1990d, 1990h, 1990i, 1990k, 1990q, 1991a, 1991f, 1991g, 1991h, 1991l, 1991m).
(2) Includes information from both the PDI Task S-1 and PDI Task S-1 Supplemental Reports for on- and off-Site locations.
(3) Off-Site
(4) One ATB (Aquifer, Thickness and Boundary) boring was used as a monitoring well. Includes 14 Phase I wells, 7 Phase 2 wells, and 11 wells for the Arsenic Pit/Chromium Lagoon groundwater investigation.
(5) Includes pumping wells and piezometers, most of which are temporary, from two separate pump tests and one recharge test.

SUMMARY OF PDI - LABORATORY PROGRAM (1)

PDI Task	Soil/Sediment Samples	Groundwater Samples	Air Samples
S-1	433 (2)	-	-
S-2	68	-	-
S-3	15	-	-
S-4	23	3	-
GW-1 (3)	-	63	-
GW-2 (3)	-	-	-
GW-3	-	6	-
SW-1	606	-	-
SW-2	5		-
A-1	-	-	45 (4)
A-2	-	-	9
Totals	1145	66	54

(1) Excludes QA/QC samples and field screening samples. Does not include subsamples (e.g., one soil sample for VOC and metals analysis. From (Golder, 1990c, 1990d, 1990h, 1990i, 1990k, 1990q, 1991a, 1991c, 1991f, 1991g, 1991k, 1991l, 1991n, 1991o).
(2) Includes information from both the PDI Task S-1 and PDI Task S-1 Supplemental Reports.
(3) Geotechnical samples also retrieved for sample description, but are not shown here.
(4) Twelve sampling stations during 1st quarter, eleven stations for 2nd, 3rd, and 4th quarter.

TABLE 5-6

SUMMARY OF PDI GEOTECHNICAL FIELD PROGRAMS

PDI Task	No. of Boreholes or Test Pits	Depth (ft)		No. of Samples	
		Total	Range	Disturbed	Undisturbed
<u>Task S-2 Stability of Hide Piles</u>					
Pre-Design Investigation	17 Boreholes	377.4	8.4 to 40.5	93	13
From RI/FS	14 Boreholes	349.6	1.0 to 40.0	54	0
<u>Task S-4 Foundation Data</u>					
Pre-Design Investigation	13 Boreholes	298.1	3.5 to 42.1	61	0
	22 Test Pits	98.1	0.8 to 8.0	32	0
From RI/FS	16 Boreholes	462.1	0.8 to 100.0	39	0
Totals	60 Boreholes	1487.2	0.8 to 100.0	247	13
	22 Test Pits	98.1	0.8 to 8.0	32	0

Note: PDI = Pre-Design Investigation
RI/FS = Remedial Investigation/Feasibility Study (Stauffer Chemical Company, 1983, 1984 and 1985).

TABLE 5-7

SUMMARY OF PDI GEOTECHNICAL LABORATORY PROGRAMS										
Water Content	Atterberg Limits	Grain Size Analysis	Organic Content	Specific Gravity	Unit Weight	Modified Proctor	Hydraulic Conductivity	Shear Strength	Consolidation	USC
<u>Task S-2 Stability of Hide Piles</u>										
66	39	46	29	18	11	4	3	14	8	45
<u>Task S-4 Foundation Data</u>										
17	15	15	1	4	-	4	-	3	3	15
<u>Totals Tasks S-2 and S-4</u>										
83	54	61	30	22	11	8	3	17	11	60

Note: Laboratory Programs for Pre-Design Investigation Tasks S-2 and S-4
USC = Classification by Unified Soil Classification System
Shear Strength Tests = Consolidated - Undrained and/or Consolidated-Drained Triaxial Tests
PDI = Pre-Design Investigation

TABLE 5-8

SUMMARY OF LABORATORY TEST RESULTS - TASK 8-2 — INDUSTRI-PLEX SITE - WOBURN, MA

BOREHOLE NO.	DEPTH (FT-BGS)	SAMPLE NO.	SAMPLE TYPE	NATURAL WATER CONT.(%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTIC INDEX	ORGANIC CONTENT (%)	GRAIN SIZE: % PASSING 200 SIEVE	GRAIN SIZE: SIEVE ANALYSIS	GRAIN SIZE: HYDROMETER TEST	SPECIFIC GRAVITY	UNIT WT.(PCF)	MODIFIED PROCTOR: MAX. D.D (PCF)	MODIFIED PROCTOR: OPTIMUM MOISTURE CONTENT	HYDRAULIC CONDUCTIVITY (cm/sec)	SHEAR STRENGTH	CONSOLI-DATION	USCS CLASS.	MATERIAL TYPE
1	0-2	S-1	DO	45.6	-	-	-	-	53.9	*	*	-	-	-	-	-	-	-	SM-ML	SURFICIAL
1	5-7	S-2	DO	23.2	NP	NP	NP	3.5	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
1	10-12	S-3	DO	19.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
1	13-15	ST-1	TO	16.1	NP	NP	NP	-	10.9	*	*	2.69	92.0	-	-	-	-	#	SP	FILL & HIDE
1	15-17	S-4	DO	20.5	-	-	-	-	12.0	*	*	-	-	-	-	-	-	-	SP-SM	FILL & HIDE
1	20-22	ST-2	TO	16.1	NP	NP	NP	2.2	-	*	*	2.82	125.6	-	-	-	X	-	SP	FILL & HIDE
1	22-24	S-5	DO	15.8	NP	NP	NP	0.6	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
1	25-27	S-6	DO	28.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OUTWASH SAND
1	30-32	S-7	DO	20.6	NP	NP	NP	-	5.1	*	*	-	-	-	-	-	-	-	SP	OUTWASH SAND
1	0-5	-	BULK	37.2	NP	NP	NP	-	46.0	*	*	2.81	-	-	-	-	X	-	SM-ML	SURFICIAL
2	0-2	S-1	DO	25.2	-	-	-	-	75.1	*	*	-	-	-	-	-	-	-	ML	SURFICIAL
2	5-7	S-2	DO	25.9	NP	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	SURFICIAL
2	8-10	ST-1	TO	36.2	NP	NP	NP	9.6	23.5	*	*	2.96	83.0	-	-	-	-	#	SP-SM	FILL & HIDE
2	10-12	S-3	DO	22.8	-	-	-	-	19.0	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
2	15-17	S-4	DO	25.7	NP	NP	NP	8.8	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
2	19-21	ST-2	TO	32.8	NP	NP	NP	12	18.6	*	*	3.0	65.8	-	-	-	X	#	SM	FILL & HIDE
2	21-23	S-5	DO	36.7	-	-	-	-	16.3	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
2	25-27	S-6	DO	20.5	NP	NP	NP	5.6	-	-	-	-	-	-	-	-	-	-	-	F&H/OUTWASH SAND
2	28-30	ST-3	TO	12.8	NP	NP	NP	0.8	1.4	*	*	2.75	-	-	-	-	X	#	SP	OUTWASH SAND
2	30-32	S-7	DO	15.2	-	-	-	-	4.8	*	*	-	-	-	-	-	-	-	-	OUTWASH SAND
3	0-2	S-1	DO	41.7	NP	NP	NP	7.0	60.0	*	*	-	-	-	-	-	-	-	ML	SURFICIAL
3	5-7	S-2	DO	22.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OUTWASH SAND
3	10-12	S-3A	DO	23.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	OUT. SAND/GLAC. TILL
3	12.7-14.2	S-4	DO	13.0	-	-	-	-	5.7	*	*	-	-	-	-	-	-	-	SP-SM	GLACIAL TILL
3	0-5	-	BULK	27.8	NP	NP	NP	-	16.2	*	*	2.72	-	-	-	-	X	#	SM	FILL & HIDE

* Test performed. See grain size distribution curves for results.

X Test performed. See Mohr circles and p-q plot for results.

\# Test performed. See e-log p curves for results.

(CONT'D)

TABLE 5-8

SUMMARY OF LABORATORY TEST RESULTS - TASK S-2 INDUSTRI-PLEX SITE - WOBURN, MA

BOREHOLE NO.	DEPTH (FT-BGS)	SAMPLE NO.	SAMPLE TYPE	NATURAL WATER CONT.(%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	ORGANIC CONTENT (%)	GRAIN SIZE: % PASSING 200 SIEVE	SIEVE ANALYSIS	HYDROMETER TEST	SPECIFIC GRAVITY	UNIT WT.(PCF)	MODIFIED PROCTOR: MAX. D.D (PCF)	OPTIMUM MOISTURE CONTENT	HYDRAULIC CONDUCTIVITY (cm/sec)	SHEAR STRENGTH	CONSOLI-DATION	USCS CLASS.	MATERIAL TYPE
5	5-7	S-2	DO	56.1	NP	NP	NP	8.1	68.1	*	*	-	-	-	-	-	-	-	ML	SURFICIAL
5	10-12	S-3	DO	26.9	-	-	-	-	0.2	*	*	-	-	-	-	-	-	-	SP	OUTWASH SAND
7	10-11.5	S-3	DO	18.1	-	-	-	-	3.3	*	*	-	-	-	-	-	-	-	SP	OUTWASH SAND
7	15-17	S-4	DO	8.9	NP	NP	NP	-	13.6	*	*	-	-	-	-	-	-	-	SW	GLACIAL TILL
8	0-2	S-1	DO	77.0	NP	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	OUTWASH SAND
8	5.5-7.5	S-3	DO	27.0	-	-	-	-	3.8	*	*	-	-	-	-	-	-	-	SP	OUTWASH SAND
9	0-2	S-1	DO	17.5	-	-	-	-	23.4	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
9	5-7	S-2	DO	45.6	NP	NP	NP	11.8	23.6	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
9	10-12	S-3	DO	53.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
9	15-17	S-4	DO	21.0	NP	NP	NP	-	20.2	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
9	18-20	ST-2	TO	21.2	NP	NP	NP	3.9	12.7	*	*	2.95	101.8	-	-	-	X	#	SP	FILL & HIDE
9	20-22	S-5	DO	31.9	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
9	25-27	S-6	DO	30.3	NP	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
9	31-32.5	S-7	DO	37.2	-	-	-	7.7	21.6	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
9	-	-	BULK	-	-	-	-	-	-	-	-	-	-	-	-	4.5xE-7	X	#	-	FILL & HIDE
10	0-2	S-1	DO	14.3	NP	NP	NP	4.6	20.5	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
10	5-7	S-2	DO	26.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
10	15-17	ST-3	TO	22.6	NP	NP	NP	3.3	11.1	*	*	2.81	131.7	-	-	-	X	-	SP	FILL & HIDE
10	17-19	S-4	DO	45.0	-	-	-	6.4	35.6	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
10	22-24	S-5	DO	25.8	-	-	-	-	16.3	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
10	30-32	S-7	DO	17.2	NP	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
10	33-35	ST-4	TO	25.0	NP	NP	NP	6.9	14.9	*	*	2.51	97.4	-	-	4.5xE-6	X	#	SP	FILL & HIDE
10	35-37	S-8	DO	30.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
10	-	-	BULK	23.4	NP	NP	NP	5.5	14.9	*	*	2.68	-	111.5	12	-	X	-	SM	FILL & HIDE

* Test performed. See grain size distribution curves for results.

X Test performed. See Mohr circles and p-q plot for results.

\# Test performed. See e-log p curves for results.

(CONT'D)

~~Golder Associates~~

SUMMARY OF LABORATORY TEST RESULTS - TASK 6-2 INDUSTRI-PLEX SITE - WOBURN, MA

BOREHOLE NO.	DEPTH (FT-BGS)	SAMPLE NO.	SAMPLE TYPE	NATURAL WATER CONT.(%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTIC INDEX	ORGANIC CONTENT (%)	GRAIN SIZE: % PASSING 200 SIEVE	GRAIN SIZE: SIEVE ANALYSIS	GRAIN SIZE: HYDROMETER TEST	SPECIFIC GRAVITY	UNIT WT.(PCF)	MODIFIED PROCTOR: MAX. D.D (PCF)	MODIFIED PROCTOR: OPTIMUM MOISTURE CONTENT	HYDRAULIC CONDUCTIVITY (cm/sec)	SHEAR STRENGTH	CONSOLI-DATION	USCS CLASS.	MATERIAL TYPE
11	0-2	S-1	DO	22.9	NP	NP	NP	-	35.3	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
11	3-5	ST-1	TO	33.9	NP	NP	NP	12.8	35.8	*	*	2.66	96.0	-	-	2XE-6	X	#	SM	FILL & HIDE
11	5-7	S-2	DO	37.9	-	-	-	8.2	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
11	10-12	S-3	DO	38.5	NP	NP	NP	-	35.7	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
11	15-17	S-4	DO	42.6	-	-	-	9.2	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
11	20-22	S-5	DO	31.0	NP	NP	NP	-	6.0	*	*	-	-	-	-	-	-	-	SP-SM	OUTWASH SAND
12	3-5	ST-1	TO	14.4	NP	NP	NP	3.5	6.5	*	*	2.58	94.9	-	-	-	X	-	SP	FILL & HIDE
12	18-20	ST-2	TO	23.3	NP	NP	NP	4.2	14.2	*	*	2.78	94.6	-	-	-	X	-	SP-SM	FILL & HIDE
13	0-2	S-1	DO	18.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
13	5-7	S-2	DO	24.9	-	-	-	-	20.6	*	*	-	-	-	-	-	-	-	SM	FILL & HIDE
13	18-20	ST-2	TO	15.7	NP	NP	NP	19.1	19.1	*	*	2.49	83.9	-	-	-	X	-	SM	FILL & HIDE
13	25-27	S-6	DO	28.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FILL & HIDE
13	35.5-37	S-8	DO	22.9	NP	NP	NP	-	3.8	*	*	-	-	-	-	-	-	-	SP	OUTWASH SAND
13	-	-	BULK	17.5	NP	NP	NP	19.1	3.7	*	*	2.63	-	94.5	16	-	-	-	SP	FILL & HIDE
15	8-10	ST-1	TO	20.1	NP	NP	NP	3.3	7	*	*	2.64	-	-	-	-	-	-	SP	FILL & HIDE
15	-	-	BULK	19.5	NP	NP	NP	2.1	7.1	*	*	2.65	-	114	11.5	-	X	-	SP-SM	FILL & HIDE
16	0-2	S-1	DO	44.1	-	-	-	-	13.4	*	*	-	-	-	-	-			SM	SURFICIAL
16	15-17	S-4	DO	13.2	NP	NP	NP	0.4	16.5	*	*	-	-	-	-	-			SM	GLACIAL TILL
WHP	-	-	BULK	-	NP	NP	NP	-	-	-	-	-	-	106.5	13.4	-	-	-	-	-

* Test performed. See grain size distribution curves for results.

X Test performed. See Mohr circles and p-q plot for results.

\# Test performed. See e-log p curves for results.

SUMMARY OF LABORATORY TEST RESULTS - TASK S-4 INDUSTRI-PLEX SITE - WOBURN, MA

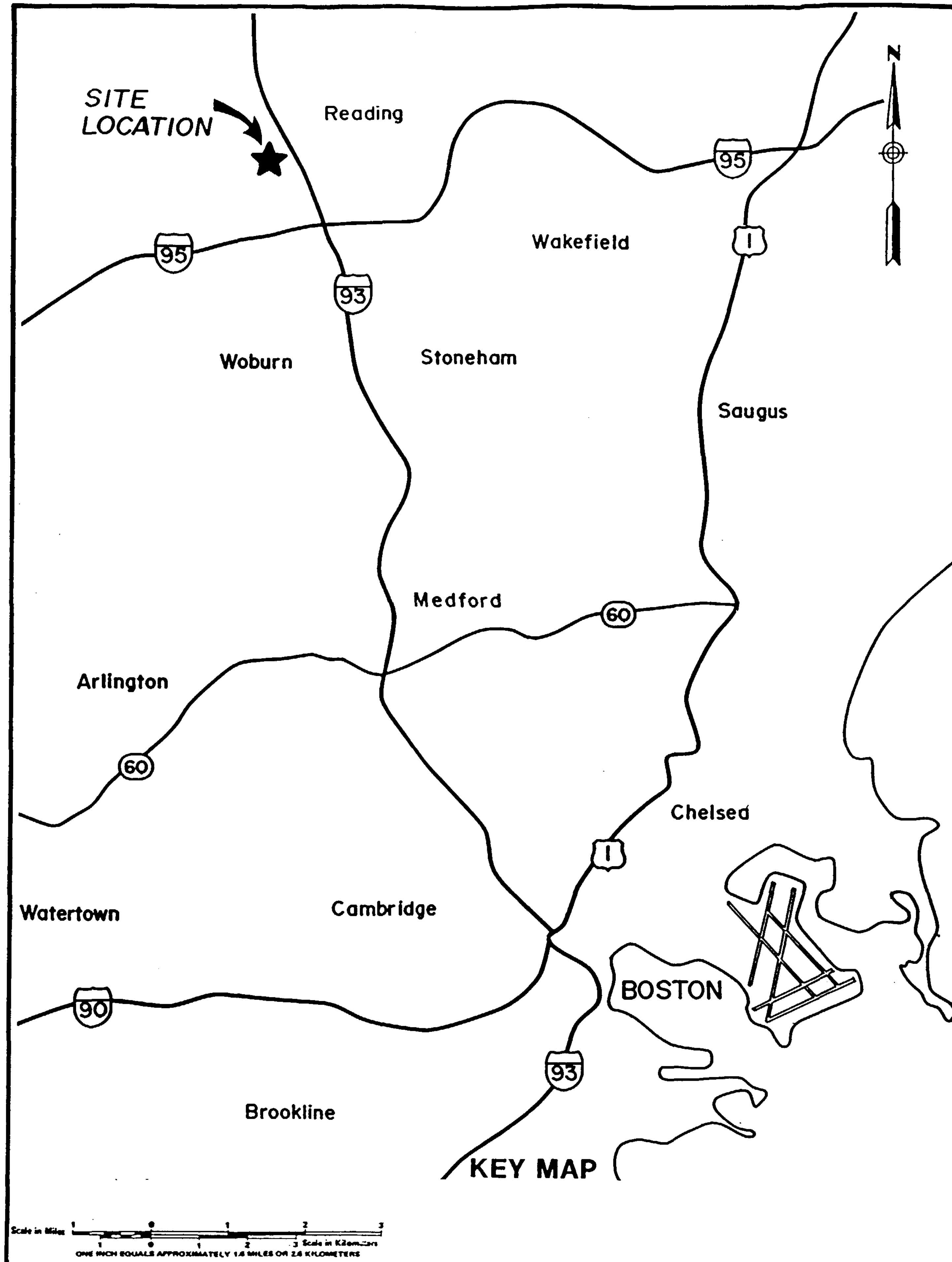
					ATTERBERG LIMITS			GRAIN SIZE				MODIFIED PROCTOR		SHEAR STRENGTH		CONSOLIDATION				
BOREHOLE/ TEST PIT	DEPTH (FT-BGS)	SAMPLE NO.	SAMPLE TYPE	NATURAL WATER CONT.(%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTIC INDEX	% PASSING 200 SIEVE	HYDROMETER TEST	ORGANIC CONTENT	SPECIFIC GRAVITY	MAX. D.D. (PCF)	OPT. MOIST. CONTENT	C'	PHI'	Eo	Cc	USCS CLASS.	GEOLOGIC UNIT	FOUNDATION LOCATION
T1	0-2	S-1	DO	4.1	NP	NP	NP	7.0	*	-	-	-	-	-	-	-	-	SP-SM	Surficial	East Hide
T3	0-2	S-1	DO	92.7	NP	NP	NP	48.6	*	11.8	-	-	-	-	-	-	-	SM-ML	Waste	West Hide
T3	9-11	S-3	DO	25.6	NP	NP	NP	0.1	*	-	-	-	-	-	-	-	-	SP	Sand	West Hide
T3	14-16	S-4	DO	10.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Till	West Hide
T4	0-2	S-1	DO	24.0	NP	NP	NP	22.0	*	-	-	-	-	-	-	-	-	SM	Fill	Chromium
T4	5.5-7.5	S-2	DO	27.5	NP	NP	NP	17.9	*	-	-	-	-	-	-	-	-	SM	Fill	Chromium
T4	10.5-12.5	S-3	DO	20.0	NP	NP	NP	3.7	*	-	-	-	-	-	-	-	-	SP	Sand	Chromium
T4	25.5-27.5	S-6	DO	18.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Till	Chromium
SD1	14-16	S-4	DO	9.5	NP	NP	NP	9.6	*	-	-	-	-	-	-	-	-	GW-GM	Till	Site Develop
SD2	5-7	S-2	DO	8.7	NP	NP	NP	18.0	*	-	-	-	-	-	-	-	-	SM	Sand	Site Develop
SD2	10-12	S-3	DO	11.5	NP	NP	NP	17.7	*	-	-	-	-	-	-	-	-	SM	Till	Site Develop
P8	2.5-3.8	-	BULK	43.0	NP	NP	NP	12.5	*	-	-	-	-	-	-	-	-	GM	Fill	West Hide
P10	0-3	-	BULK	24.3	NP	NP	NP	35.3	*	-	3.63	127.0	15.0	-	-	-	-	SM	Fill	Chromium
P12	4-7	-	BULK	7.0	NP	NP	NP	27.2	*	-	-	-	-	-	-	-	-	SM	Till	Site Develop
P13	0-7	-	BULK	10.6	NP	NP	NP	13.9	*	-	2.61	120.3	8.0	0.0	36.7	0.440	.090	SM	Sand	Site Develop
P14	0.0-3.8	-	BULK	7.9	NP	NP	NP	14.0	-	-	2.51	123.4	8.7	0.0	35.8	0.349	.013	SM	Sand	Site Develop
P15	0-6	-	BULK	14.3	NP	NP	NP	14.5	-	-	2.63	117.2	11.5	0.0	35.6	0.470	.066	SM	Sand	Site Develop

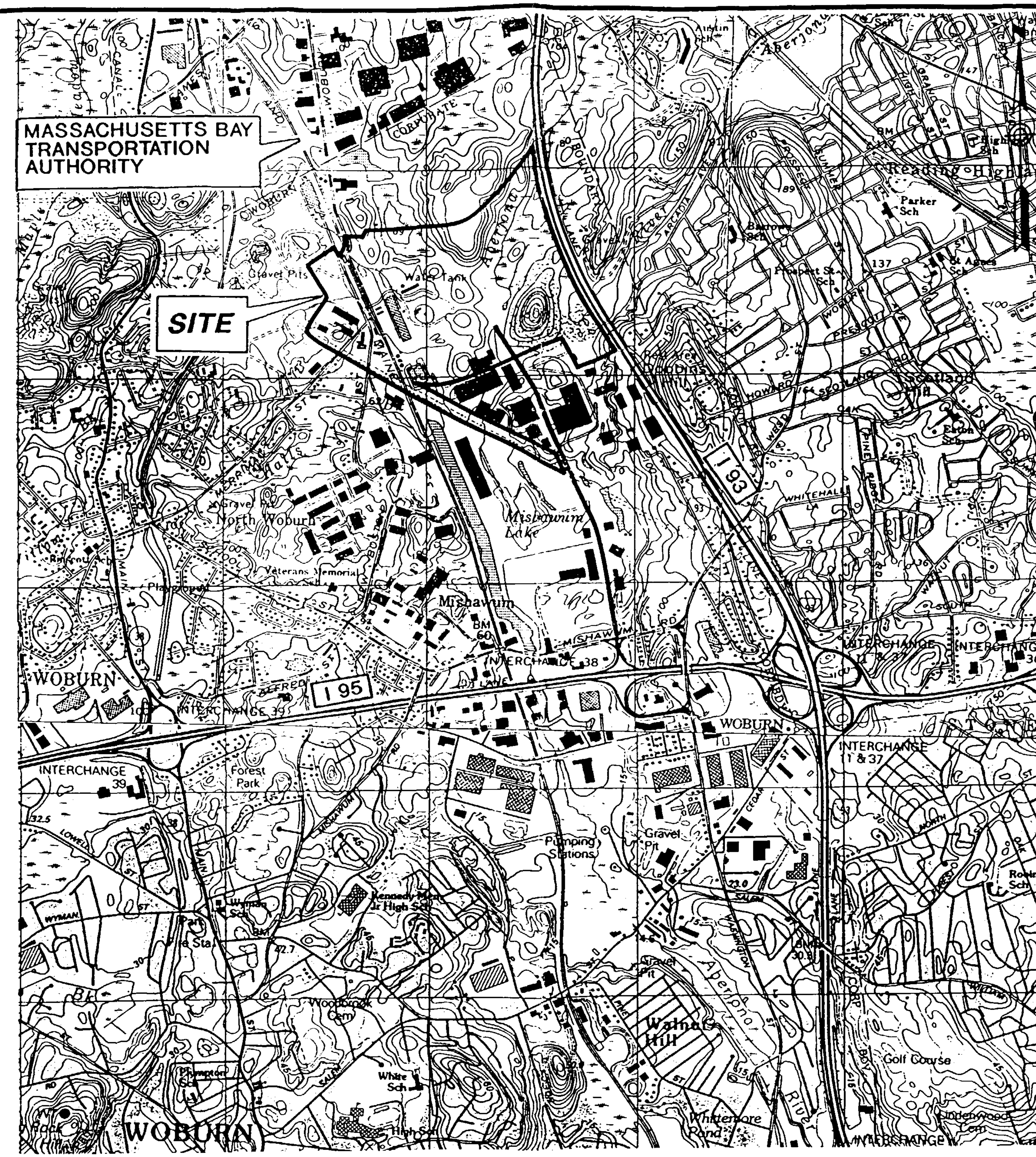
* Test Performed
\- Test Not Performed
NP Non-Plastic
PHI' Effective Frictional Angle

C' Effective Cohesion
Eo Initial Void Ratio
Cc Compression Index
DO Split Spoon Sample

BGS Below Ground Surface

Reference: Table 3 - Golder, 1990d.





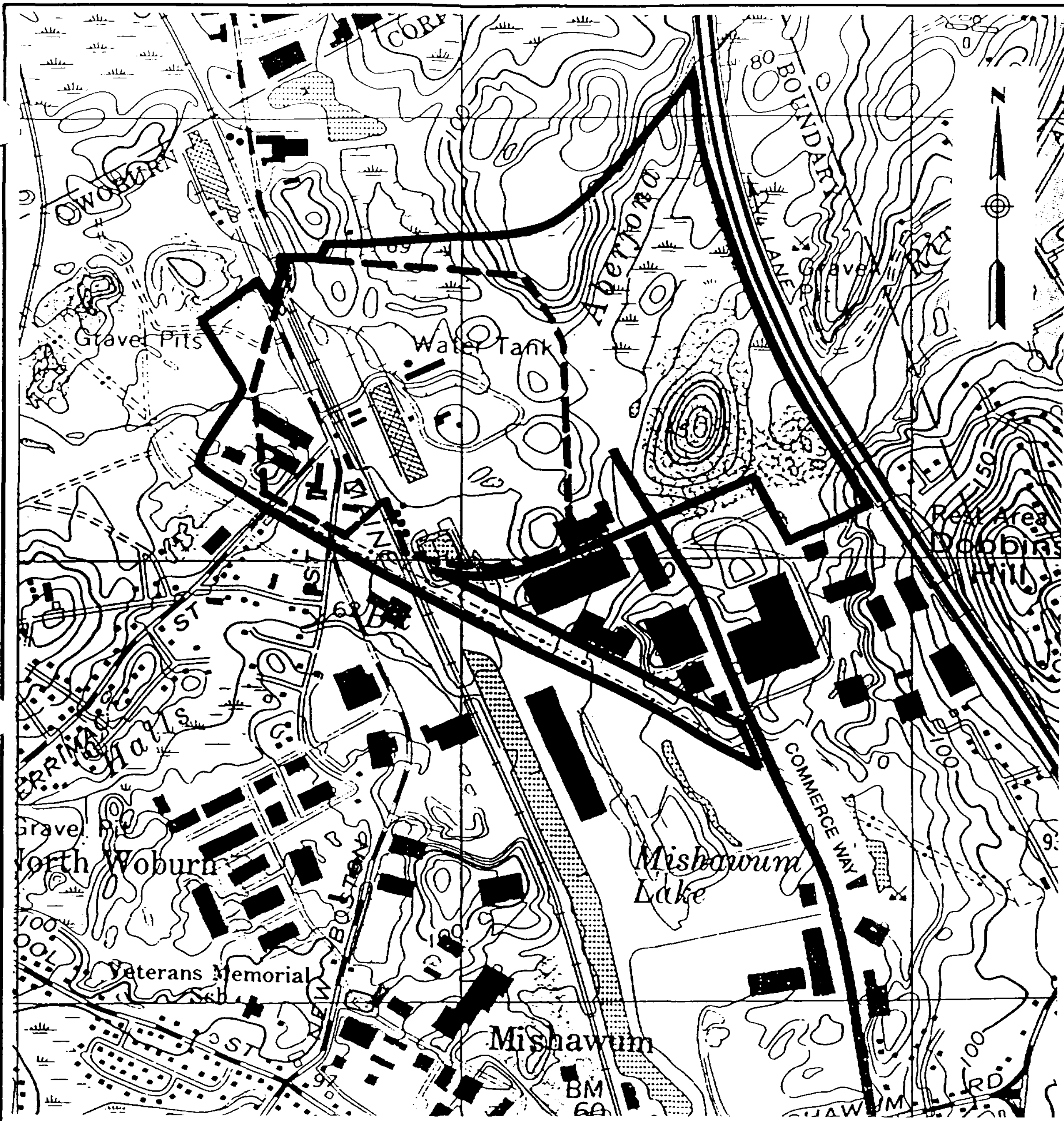
REFERENCE: TAKEN FROM U.S.G.S. QUADRANGLES READING (1979), WILMINGTON (1979) AND BOSTON NORTH (1985), MA.
SCALE (APPROX) 1:25000

LOCATION PLAN

APR 2 5 1992

JOB NO.	903-6400	SCALE	AS SHOWN	KEY MAP AND LOCATION PLAN
DRAWN	LAS	DATE	12/26/90	
CHECKED	BWM 04/12/91	DWG. NO.	MA01-292	
Golder Associates				INDUSTRI-PLEX SITE REMEDIAL TRUST — FIGURE 5-1

152110



REFERENCE: U.S.G.S. QUADRANGLE MAPS FOR READING(1979), WILMINGTON(1979), AND BOSTON NORTH(1985).MA

APPROXIMATE EXTENT OF MANUFACTURING PLANT OPERATIONS

SITE BOUNDARY

APR 25 1992

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CHECKED: BWM 04/12/91	DWG. No.: MA01-498	
Golder Associates		INDUSTRI-PLEX SITE REMEDIAL TRUST — FIGURE **5-2**

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Description of Item Merrimac and New England Facilities (1918)

Number and Type of Item(s) Figure 5-3