Florida Power
CORPORATION

INTEROFFICE CORRESPONDENCE

A-C-XMTL.FRM

Nuclear Engineering	NA1A	3865
Office	MAC	Telephone

SUBJECT: Crystal River Unit 3
Quality Record Transmittal - Analysis/Calculation

TO: Records Management – SA2A

The following analysis/calculation package is submitted as the QA Record copy:

DOCNO (FPC DOCUMENT IDENTIFICATION NUMBER)	REV.	SYSTEM(S)	TOTAL PAGES TRANSMITTED
M-00-0002	1	AH	23

TITLE
CR3 Control Room Chlorine Concentration for a Transportation Accident

KWDS (IDENTIFY KEYWORDS FOR LATER RETRIEVAL)
Chlorine, Transportation, toxic gas, CCHE, CREVS, Control Room Habitability

DXREF (REFERENCES OR FILES - LIST PRIMARY FILE FIRST)	
PT-366	
PT-367	
PT-368	

VEND (VENDOR NAME)	VENDOR DOCUMENT NUMBER (DXREF)	SUPERSEDED DOCUMENTS (DXREF)
[redacted] TAG [redacted]		
AH-648-CE		
AH-649-CE		
[redacted] PART NO. [redacted]		

COMMENTS (USAGE RESTRICTIONS, PROPRIETARY, ETC.)

NOTE:
Use Tag number only for valid tag numbers (i.e., RCV-8, SWV-34, DCH-99); otherwise, use Part number field (i.e., CSC14599, AC1459). If more space is required, write "See Attachment" and list on separate sheet.

**FOR RECORDS MANAGEMENT USE ONLY **
Quality Record Transmittal received and information entered into SEEK.
Entered by: _____ Date _____
(Return copy of Quality Record Transmittal to DE Support Specialist.)

DESIGN ENGINEER	DATE	VERIFICATION ENGINEER	DATE	SUPERVISOR, DESIGN ENG	DATE
R. A. Crandall	9/29/00	K. D. Ward	9/6/00	G. E. Englert	9/13/00

cc: Nuclear Projects (If MAR/EMAR/CGWR/PEERE Return to Service Related) ☐ Yes ☒ No
Supervisor, Config. Mgt. Info.
Mgr., Design Control (Original) w/attach
Mgr., Radiological Emergency Planning w/attach ☐ Yes ☒ No

Calculation Review form Part III or IV actions required ☐ Yes ☒ No
(If Yes, send copy of the Calculation to the Responsible Organization(s) identified in Part III on the Calculation Review form.)

Florida Power CORPORATION

ANALYSIS/CALCULATION SUMMARY

A-C-SUM.FRM

DOCUMENT IDENTIFICATION NUMBER	DISCIPLINE	CONTROL NO.	REVISION LEVEL
	M	00-0002	1

TITLE
CR3 Control Room Chlorine Concentration for a Transportation Accident

CLASSIFICATION (CHECK ONE)
☒ Safety Related
☐ Non Safety Related

MAR/EMAR/SP/CGWR/PEERE NUMBER
NA

VENDOR DOCUMENT NUMBER
NA

	APPROVAL SIGNATURES	PRINTED NAME
Design Engineer	R. A. Crandall	R. A. Crandall
Date	8/28/00	
Verification Engineer		K. D. Ward
Date	9/6/00	
Supervisor		G. E. Englert
Date	9/13/00	

ITEMS REVISED
Revision 1 adds Addendum 1, including the new Attachment 19. All pages of Rev. 0 remain valid.

PURPOSE SUMMARY
Addendum 1 (including Attachment 19) evaluates an additional case for higher assumed inleakage rates after isolation. None of the analyses or results from Rev. 0 are superceded.

RESULTS SUMMARY
Assuming automatic isolation at 48 seconds after plume arrival, the chlorine concentration 2 minutes after nasal detection is within the 15 ppm limit.
The results related to detector response time from Rev. 0 remain valid.

Florida Power CORPORATION

CALCULATION REVIEW

CALC-REV.FRM

CALCULATION NO./REV.

M-00-0002 Rev 1

PART I - DESIGN ASSUMPTION/INPUT REVIEW: APPLICABLE ☒ Yes ☐ No

The following organizations have reviewed and concur with the design assumptions and inputs identified for this calculation:

Systems Engineering - JOHN TAYLOR — Signature/Date 7/18/00

Nuclear Plant Operations - ~~JOHN SMITH~~ 7/18/00 Ken Ross — Signature/Date 9/13/00

OTHER(S)

R. Muzzi — Signature/Date 9/13/00

Signature/Date

PART II - RESULTS REVIEW: APPLICABLE ☒ Yes ☐ No

The following organizations have reviewed and concur with the results of this calculation and understand the actions which the organizations must take to implement the results.

System Engineering - JOHN TAYLOR — Signature/Date 9/8/00

Comments:

Nuclear Plant Operations - ~~JOHN SMITH~~ Ken 7/18/00 Ken Ross — Signature/Date 9/13/00

Comments:

Safety Analysis Group ☐ Yes ☒ N/A — Signature/Date

Comments:

Nuclear Plant Maintenance ☐ Yes ☐ N/A — Signature/Date

Comments:

Nuclear Licensed Operator Training ☐ Yes ☒ N/A — Signature/Date

Comments:

Manager, Nuclear Regulatory Compliance ☐ Yes ☐ N/A — Signature/Date

Comments:

Sr. Radiation Protection Engineer ☐ Yes ☒ N/A — Signature/Date

Comments:

Nuclear Plant EOP Group - KEN ROSS ☒ Yes ☐ N/A — Signature/Date 9/13/00 Ken Ross

Comments:

Design Engineering ☐ Yes ☒ N/A — Signature/Date

Comments:

OTHER: - R. MUZZI ☒ Yes ☐ N/A — Signature/Date R.A. Muzzi for R. MUZZI per email 9/13/00

CALCULATION REVIEW

CALCULATION NO./REV.
M-00-0002 Rev 1

PART III - CONFIGURATION CONTROL: APPLICABLE ☐ Yes ☒ No **PC #** _____ *

The following is a list of Plant procedures/lesson plans/other documents and Nuclear Engineering calculations which require updating based on calculation results review:

Document	Date Required	Responsible Organization

*** Generate a Precursor Card in accordance with CP-111 for tracking items not identified in other tracking mechanisms (e.g., MAR, EMAR,REA, etc.) . If calculations are listed, a copy shall be sent to the original file and eCalc updated to reflect this impact.**

PART IV - NUCLEAR ENGINEERING DOCUMENTATION REVIEW

The responsible Design Engineer must thoroughly review the below listed documents to assess if the calculation requires revision to these documents. If "Yes," the change authorization number must be listed below .

Enhanced Design Basis Document	☐ Yes ☒ No (TC#)	Vendor Qualification Package	☐ Yes ☒ No (VQP#)
FSAR	☐ Yes ☒ No (FSAR CANGE NUMBER)	Topical Design Basis Doc.	☐ Yes ☒ No (TC#)
Improved Tech. Specification	☐ Yes ☒ No (Letter#)	E&SQPM	☐ Yes ☒ No (TC#)
Improved Tech. Spec. Bases	☐ Yes ☒ No (Letter#)	Other Documents reviewed:	
Config. Mgmt. Info. System	☐ Yes ☒ No (CIDP#)	_____	☐ Yes ☐ No _____ (CHANGE DOC. REFERENCE)
Design Basis Document	☐ Yes ☒ No (TC#)	_____	☐ Yes ☐ No _____ (CHANGE DOC. REFERENCE)
Appendix R Fire Study	☐ Yes ☒ No (TC#)	_____	☐ Yes ☐ No _____ (CHANGE DOC. REFERENCE)
Fire Hazardous Analysis	☐ Yes ☒ No (TC#)	_____	☐ Yes ☐ No _____ (CHANGE DOC. REFERENCE)
NFPA Code Conformance Document	☐ Yes ☒ No (TC#)	_____	☐ Yes ☐ No _____ (CHANGE DOC. REFERENCE)

PART V - PLANT REVIEWS/APPROVALS FOR INSTRUMENT SETPOINT CHANGE

PRC/DNPO approval is required if a setpoint is to be physically changed in the plant through the NEP-213 process.

PRC Review Required ☐ Yes ☒ No

_____
PRC Chairman /Date

DNPO Review Required ☐ Yes ☒ No

_____
DNPO /Date

DESIGN ENGINEER/DATE	DESIGN ENGINEER - PRINTED NAME
R A Crandall 8/28/00	R. A. CRANDALL

REVIEWER CONCURRENCE FORM

Crystal River Unit 3

RCF.FRM

Document Number/Revision Level: M-00-0002 Rev 1

Originator: R. A. Crandall (Print) R A Crandall (Sign) 8/24/00 (Date)

Signatures delineated below signify whether the department/organization needs to review the Analysis/Calculation. This determination will be made by the individual department/organization, along with the respective discipline.
All blocks must be signed by a representative from the respective department/organization.*

Department/Organization	Review Required	Signature/Date Print	Sign	Date
		See Rev 0 for Review Requirements		
DE Electrical	☐ Yes ☐ No			
DE I&C	☐ Yes ☐ No			
DE Mechanical	☐ Yes ☐ No			
DE Structural	☐ Yes ☐ No			
Licensing	☐ Yes ☐ No			
Maintenance	☐ Yes ☐ No			
Safety Analysis/ Dose Assessment	☐ Yes ☐ No			
Operations	☐ Yes ☐ No			
Programs _____ (Identify App."R", ISI, EQ, and/or Fire Protection)	☐ Yes ☐ No			
Reactor Systems/ Safety Analysis Input Document (SAID)	☐ Yes ☐ No			
Systems Engineering	☐ Yes ☐ No			
Training	☐ Yes ☐ No			
Other _____	☐ Yes ☐ No			
Other _____	☐ Yes ☐ No			

*NOTE: In lieu of signatures by respective departments, the originator may sign for them, based on verbal concurrence (telecons), electronic mail notes, etc.

Florida Power
CORPORATION

CALCULATION VERIFICATION CHECKLIST

Crystal River Unit 3

CALVERCL.FRM

CALCULATION NUMBER	Rev.
M-00 0002	1

		YES	NO	N/A
1.	Are inputs, including codes, standards, regulatory requirements, procedures, data, and Engineering methodology correctly selected and applied?	☒	☐	☐
2.	Have assumptions been identified? Are they reasonable and justified? (re: NEP-101)	☒	☐	☐
3.	Are references properly identified, correct, and complete? (re: NEP-101)	☒	☐	☐
4.	Have applicable construction and operating experiences been considered?	☒	☐	☐
5.	Was an appropriate Design Analysis/Calculation method used?	☒	☐	☐
6.	In cases where computer software was used, has the program been verified or reverified in accordance with NEP-151 for safety related design applications and/or are inputs, formulas, and outputs associated with spreadsheets accurate?	☒	☐	☐
7.	Is the output reasonable, compared to inputs?	☒	☐	☐
8.	Has technical design information provided (via letter, REA, IOC, or telecon) by other disciplines or programs been verified by that discipline or program?	☒	☐	☐
9.	Has technical design information provided via letter or telecon from an external Engineering Organization or vendor been confirmed and accepted by FPC?	☐	☐	☒
10.	Has atypical equipment/bus alignment been considered in the calculation?	☐	☐	☒
11.	Do the calculation results indicate a non-conforming condition exists? (If "Yes," immediately notify the responsible Supervisor.)	☐	☒	☐
12.	Do the results require a change to other Engineering documents?	☐	☒	☐
12a.	If "Yes," have these documents been identified for revision on the Calculation Review Form?	☐	☐	☐

Florida Power CORPORATION

INTEROFFICE CORRESPONDENCE

A-C-XMTL.FRM

Nuclear Engineering	NA1A	3865
Office	MAC	Telephone

SUBJECT: Crystal River Unit 3
Quality Record Transmittal - Analysis/Calculation

TO: Records Management - NR2A

The following analysis/calculation package is submitted as the QA Record copy:

DOCNO (FPC DOCUMENT IDENTIFICATION NUMBER)	REV.	SYSTEM(S)	TOTAL PAGES TRANSMITTED
M-00-0002	0	AH	141

TITLE
CR3 Control Room Chlorine Concentration for a Transportation Accident

KWDS (IDENTIFY KEYWORDS FOR LATER RETRIEVAL)
Chlorine, Transportation, CCHE, Toxic gas, Control Room Habitability

DXREF (REFERENCES OR FILES - LIST PRIMARY FILE FIRST)	
PT-366	
PT-367	
PT-368	

VEND (VENDOR NAME)	VENDOR DOCUMENT NUMBER (DXREF)	SUPERSEDED DOCUMENTS (DXREF)
NA	NA	None
TAG		
AH-648-CE		
AH-649-CE		
PART NO.		

COMMENTS (USAGE RESTRICTIONS, PROPRIETARY, ETC.)
No prior analysis of chlorine transportation accident effects on the CR3 control room could be located. If any are found, they would be superceded by this calculation, which represents the current bounding case.

NOTE:

**FOR RECORDS MANAGEMENT USE ONLY **
Quality Record Transmittal received and information entered into SEEK.
Entered by: _____ Date _____
(Return copy of Quality Record Transmittal to DE Support Specialist.)

DESIGN ENGINEER	DATE	VERIFICATION ENGINEER	DATE	SUPERVISOR, DESIGN ENG.	DATE
R. A. Crandall	R A Crandall 4/4/00	K. D. Ward	4/4/00	G. E. Englert	4/4/00

cc: Nuclear Projects (If MAR/CGWR/PEERE Return to Service Related) ☐ Yes ☒ No
Supervisor, Config. Mgt. Info.
Mgr., Design Engineering (Original) w/attach
Mgr., Radiological Emergency Planning w/attach ☐ Yes ☒ No
R. Muzzi - PA3A
K. Campbell

Calculation Review form Part III actions required ☐ Yes ☒ No
(If Yes, send copy of the Calculation to the Responsible Organization(s) identified in Part III on the Calculation Review form.)

APR 10 2000

Florida Power
CORPORATION

ANALYSIS/CALCULATION SUMMARY

A-C-SUM.FRM

DOCUMENT IDENTIFICATION NUMBER	DISCIPLINE	CONTROL NO.	REVISION LEVEL
	M	00-0002	0

TITLE
CR3 Control Room Chlorine Concentration for a Transportation Accident

CLASSIFICATION (CHECK ONE)
☒ Safety Related
☐ Non Safety Related

MAR/SP/CGWR/PEERE NUMBER
NA

VENDOR DOCUMENT NUMBER
NA

	APPROVAL SIGNATURES	PRINTED NAME
Design Engineer	R A Crandall	R. A. Crandall
Date	4/3/00	
Verification Engineer	K D Ward	K. D. Ward
Date	4/3/00	
Supervisor	G E Englert	G. E. Englert
Date	4/4/00	

ITEMS REVISED
NA- Initial Issue

PURPOSE SUMMARY
To determine the CR3 control room concentration of chlorine following a chlorine truck accident at the truck's closest approach to CR3 while enroute to CR 4/5.
To determine if automatic isolation is still required by the chlorine monitor on the CCHE intake and if so, determine acceptable monitor response times and total isolation times.

RESULTS SUMMARY
1. Without automatic isolation, the CR3 control room chlorine concentration would exceed acceptance criteria.
2. With automatic isolation within 50 seconds of plume arrival, the CR3 control room concentration would remain within acceptance criteria.
3. The calculated required response time of the sensor is 15 seconds to reach 5 ppm with an actual concentration of 100 ppm. Based on previously measured response times falling well within this acceptance criteria, it is concluded that as-found response time testing is unnecessary.

Florida Power CORPORATION

CALCULATION REVIEW

CALC-REV.FRM

CALCULATION NO./REV.
M-00-0002, Rev 0

PART I - DESIGN ASSUMPTION/INPUT REVIEW: APPLICABLE ☒ Yes ☐ No

The following organizations have reviewed and concur with the design assumptions and inputs identified for this calculation:

Systems Engineering — Signature/Date: 3/20/00

Nuclear Plant Operations — Signature/Date: 3/20/00

OTHER(S)

R. MUZZI — Signature/Date: 4/3/00

Signature/Date

PART II - RESULTS REVIEW: APPLICABLE ☒ Yes ☐ No

The following organizations have reviewed and concur with the results of this calculation and understand the actions which the organizations must take to implement the results.

System Engineering — Signature/Date: 3/20/00

Comments:

Nuclear Plant Operations — Signature/Date: 3/20/00

Comments:

Safety Analysis Group ☐ Yes ☒ N/A — Signature/Date

Comments:

Nuclear Plant Maintenance ☒ Yes ☐ N/A — SEE NEXT PAGE — Signature/Date

Comments:

Nuclear Licensed Operator Training ☐ Yes ☒ N/A — Signature/Date

Comments:

Manager, Nuclear Regulatory Compliance ☒ Yes ☐ N/A — Signature/Date: 3/23/00

Comments: - LICENS.TR PREVIOUS REVIEW COMMENTS RESOLVED

Sr. Radiation Protection Engineer ☐ Yes ☒ N/A — Signature/Date

Comments:

Nuclear Plant EOP Group ☒ Yes ☐ N/A — Signature/Date — Ken Rass 3/29/00

Comments:

Design Engineering ☐ Yes ☒ N/A — Signature/Date

Comments:

OTHER: R. Muzzi ☒ Yes ☐ N/A — Signature/Date: 4/3/00

Florida Power CORPORATION

CALCULATION REVIEW

CALC-REV.FRM

CALCULATION NO./REV.
M-00-0002, Rev 0

PART I - DESIGN ASSUMPTION/INPUT REVIEW: APPLICABLE ☒ Yes ☐ No

The following organizations have reviewed and concur with the design assumptions and inputs identified for this calculation:

Systems Engineering _____ Signature/Date

Nuclear Plant Operations _____ Signature/Date

OTHER(S)

_____ _____ Signature/Date

_____ _____ Signature/Date

PART II - RESULTS REVIEW: APPLICABLE ☒ Yes ☐ No

The following organizations have reviewed and concur with the results of this calculation and understand the actions which the organizations must take to implement the results.

System Engineering _____ Signature/Date

Comments: _____

Nuclear Plant Operations _____ Signature/Date

Comments: _____

Safety Analysis Group ☐ Yes ☐ N/A _____ Signature/Date

Comments: _____

Nuclear Plant Maintenance ☑ Yes ☐ N/A Kat Mann 3/20/00 Signature/Date

Comments: NUPOST's 63939, 63935 PT-366, 367

Nuclear Licensed Operator Training ☐ Yes ☐ N/A _____ Signature/Date

Comments: _____

Manager, Nuclear Regulatory Compliance ☐ Yes ☐ N/A _____ Signature/Date

Comments: _____

Sr. Radiation Protection Engineer ☐ Yes ☐ N/A _____ Signature/Date

Comments: _____

Nuclear Plant EOP Group ☐ Yes ☐ N/A _____ Signature/Date

Comments: _____

Design Engineering ☐ Yes ☐ N/A _____ Signature/Date

Comments: _____

OTHER: ☐ Yes ☐ N/A _____ Signature/Date

Florida Power CORPORATION

CALCULATION REVIEW

CALCULATION NO./REV.
M-00-0002, Rev 0

PART III - CONFIGURATION CONTROL: APPLICABLE ☒ **Yes** ☐ **No PC #** _____

The following is a list of Plant procedures/lesson plans/other documents and Nuclear Engineering calculations which require updating based on calculation results review:

Document	Date Required	Responsible Organization
NOTE - PT-366, PT-367 AND PT-368 DO NOT REQUIRE REVISION AS THE CURRENT REVISIONS OF THESE PROCEDURES ARE CONSISTENT WITH THIS CALCULATION. HOWEVER, A NUPOST ITEM HAS BEEN INITIATED TO ADD A REFERENCE TO THIS NEW CALCULATION FOR COMPLETENESS		

Upon completion, generate a Precursor Card in accordance with CP-111 for tracking of actions for any items identified in Part III. If calculations are listed, a copy shall be sent to the original file and the calculation log updated to reflect this impact.

PART IV - NUCLEAR ENGINEERING DOCUMENTATION REVIEW

The responsible Design Engineer must thoroughly review the below listed documents to assess if the calculation requires revision to these documents. If "Yes," the change authorizations must be listed below and issued concurrently with the calculation.

Enhanced Design Basis Document	☒ Yes ☐ No	(TC#) 1171	Vendor Qualification Package	☐ Yes ☒ No	(VQP#)
FSAR TMB 8/10	☐ Yes ☒ No	(Letter#)	Topical Design Basis Doc.	☒ Yes ☐ No	(TC#) 1170
Improved Tech. Specification	☐ Yes ☒ No	(Letter#)	E&SQPM TMB 9/4	☐ Yes ☒ No	(TC#)
Improved Tech. Spec. Bases	☐ Yes ☒ No	(Letter#)	Other Documents reviewed:		
Config. Mgmt. Info. System	☐ Yes ☒ No	(CIDP#)	_____	☐ Yes ☐ No	(CHANGE DOC. REFERENCE)
Design Basis Document	☐ Yes ☒ No	(TC#)	_____	☐ Yes ☐ No	(CHANGE DOC. REFERENCE)
Appendix R Fire Study	☐ Yes ☒ No	(TC#)	_____	☐ Yes ☐ No	(CHANGE DOC. REFERENCE)
Fire Hazardous Analysis	☐ Yes ☒ No	(TC#)	_____	☐ Yes ☐ No	(CHANGE DOC. REFERENCE)
NFPA Code Conformance Document	☐ Yes ☒ No	(TC#)	_____	☐ Yes ☐ No	(CHANGE DOC. REFERENCE)

PART V - PLANT REVIEWS/APPROVALS FOR INSTRUMENT SETPOINT CHANGE

PRC/DNPO approval is required if a setpoint is to be physically changed in the plant through the NEP-213 process.

PRC Review Required ☐ Yes ☒ No _____ PRC Chairman /Date

DNPO Review Required ☐ Yes ☒ No _____ DNPO /Date

DESIGN ENGINEER/DATE	DESIGN ENGINEER - PRINTED NAME
R A Crandall 4/3/00	R. A. Crandall

CALCULATION VERIFICATION CHECKLIST

Florida Power CORPORATION

Crystal River Unit 3

CALVERCL.FRM

CALCULATION NUMBER M-00-0002 Rev. 0

	YES	NO	N/A
1. Are inputs, including codes, standards, regulatory requirements, procedures, data, and Engineering methodology correctly selected and applied?	☑	☐	☐
2. Have assumptions been identified? Are they reasonable and justified? (re: NEP-101)	☑	☐	☐
3. Are references properly identified, correct, and complete? (re: NEP-101)	☑	☐	☐
4. Have applicable construction and operating experiences been considered?	☑	☐	☐
5. Was an appropriate Design Analysis/Calculation method used?	☑	☐	☐
6. In cases where computer software was used, has the program been verified or reverified in accordance with NEP-151 for safety related design applications and/or are inputs, formulas, and outputs associated with spreadsheets accurate?	☑	☐	☐
7. Is the output reasonable, compared to inputs?	☑	☐	☐
8. Has technical design information provided (via letter, REA, IOC, or telecon) by other disciplines or programs been verified by that discipline or program?	☑	☐	☐
9. Has technical design information provided via letter or telecon from an external Engineering Organization or vendor been confirmed and accepted by FPC?	☐	☐	☑
10. Has atypical equipment/bus alignment been considered in the calculation?	☐	☐	☑
11. Do the calculation results indicate a non-conforming condition exists? (If "Yes," immediately notify the responsible Supervisor.)	☐	☑	☐
12. Do the results require a change to other Engineering documents?	☐	☐	☐
12a. (If "Yes," have these documents been identified for revision on the Calculation Review Form?)	☑	☐	☐

REVIEWER CONCURRENCE FORM

Crystal River Unit 3

RCF.FRM

Document Number/Revision Level: ___M-00-0002 **Rev** 0_____

Originator: _R. A. Crandall_____ R A Crandall
(Print) (Sign)

Signatures delineated below signify whether the department/organization needs to review the Analysis/Calculation. This determination will be made by the individual department/organization, along with the respective discipline. All blocks must be signed by a representative from the respective department/organization.*

Department/Organization	Review Required	Signature/Date
DE Electrical	☐ Yes ☒ No	RM Rubio / 3-15-00
DE I&C	☐ Yes ☒ No	[illegible] / 3-15-00
DE Mechanical	☐ Yes ☒ No	[illegible] / 3-15-2000
DE Structural	☐ Yes ☒ No	[illegible] / 3-14-00
ISI	☐ Yes ☑ No	DJ Spoering / 3/15/00
Licensing	☒ Yes ☐ No	RA Crandall for S. Powell / 3/14/00
Maintenance	☒ Yes ☐ No	RA Crandall for A. Fowler / 3/15/00
Nuclear Safety ~~Management~~ Analysis	☐ Yes ☒ No	Ted Williams / 3/14/00
Operations	☒ Yes ☐ No	RA Crandall for J. Smith / 3/14/00
Operations (EOP/AP)	☒ Yes ☐ No	RA Crandall for Ken Kiss / 3/15/00
Programs _____ (Identify App."R", EQ, and/or Fire Protection)	☐ Yes ☒ No	[illegible] / 3/15/00
Systems Engineering	☒ Yes ☐ No	[illegible] / 3/15/00
Training	☐ Yes ☒ No	RA Crandall for Dave Donnotter - voice mail / 3/15/00
Other Bob Muzzi	☒ Yes ☐ No	[illegible] / 3/15/00
Other _____	☐ Yes ☐ No	_____ / _____

*NOTE: In lieu of signatures by respective departments, the originator may sign for them, based on verbal concurrence (telecons) , cc:mail notes, etc.

DOCUMENT NUMBER

M 00-0002 Rev 0

PROJECT

CR3 Control Room Chlorine Concentration for a Transportation Accident

I. PURPOSE

The purpose of this calculation is to determine the Crystal River Unit 3 control room concentration following a chlorine truck accident at the truck's closest approach to CR3 on-route to CR4/5. The calculation will be used to determine if a chlorine detector with automatic isolation functions is still required for the CR3 CCHE intake duct. If required, response time acceptance criteria will be determined.

There is no record of any previous analysis of a chlorine truck transportation accident and its effects on the CR3 control room. However, recent information (Ref. 1) has indicated that there is approximately one truck shipment per week of chlorine to CR Units 4 and 5. This exceeds the frequency guidance in Regulatory Guide 1.78 (Ref. 2) which states that evaluations should be performed if the frequency of truck shipments exceeds 10 per year. The lack of an existing analysis was documented in PC 00-0083, which specified the action to perform this analysis.

II. RESULTS/CONCLUSIONS

1. For the assumed transportation accident, without automatic isolation, the control room chlorine concentration would exceed the toxicity limit of 15 ppm within 2 minutes of nasal detection. This is unacceptable and hence automatic detection and isolation must be maintained.
2. For an assumed isolation time of 50 seconds following plume arrival, the concentration remains less than the toxicity limit of 15 ppm for at least 2 minutes following operator awareness. This is acceptable.
3. Any one of the following response time test acceptance criteria will demonstrate the required 50 second overall isolation time:
   a. 25 second response to high alarm signal using 13.3 ppm test concentration, or
   b. 20 second response to high alarm signal using 40 ppm test concentration, or
   c. 15 second response to high alarm signal using 100 ppm test concentration.
4. Based on the analysis of past time response testing results demonstrating that the 15 second response to a 100 ppm concentration could be met with significant margin, as-found time response testing is not required - See Section VI - Step 5.

III. DESIGN INPUTS

1. Shipping Container size - 1 ton of Chlorine = 907 kg - Attachment 1

2. Receptor Height above ground - 20.8 meters - Due primarily to the berm, the ground level at the control complex is higher than the ground level at the site of the truck accident, which is at the intersection where the road to CR 4/5 goes North from the main access road, just West of the guardhouse. However, this does not matter in the calculation, as the plume, being heavier than air, will follow

DESIGN ENGINEER	DATE	VERIFICATION ENGINEER	DATE	SUPERVISOR, NUCLEAR ENGINEERING	DATE
R. A. Crandall	4/3/00	K. D. Ward	4/4/00	G. E. Englert	4/4/00

the contour of the ground. Hence the effective height of the receptor above the release point is the height of the control complex intake compared to the ground level at the control complex. Drawing A-102-052 gives the grade elevation at the control complex as El 118.5 ft and the top of the control complex roof slab as El 186.8 ft. Therefore the difference is 68.3 ft = 20.8 m. Note that the intake is actually a few feet above the roof slab elevation, however the roof slab elevation is used for conservatism.

3. Distance from truck accident location to control complex intake - 366 meters - The CR3 Site drawings are not drawn to scale. A Black & Veatch Consulting Engineer scale drawing was located and used to measure the distance from the accident location to the control complex intake. The drawing is the Site Grading Plan for Project 76-45, but the drawing number is not legible. The important section of that drawing is reproduced as Attachment 2.

4. CR3 Control Complex Volume - 364,922 ft^3 - S&L Design Input Transmittal, DIT-CR-0044, "Control Complex Volume", 10/1/97

5. Control Complex unfiltered air intake prior to isolation - 5700 cfm = 2.69 m^3/sec FPC Correspondence No. 3F0587-11 from E. C. Simpson to NRC, dated 5/7/87, "Control Room Habitability Sulfur Dioxide Supplement Report". Flow testing performed per MP-217 on 8/6/99 measured an intake flow of 4192 cfm. This is well within 5700 cfm. The higher the assumed flow, the more conservative the results.

6. Control Complex unfiltered air inleakage after isolation - 523 cfm = 0.247 m^3/sec EEF-99-014, Rev. 0. This Engineering Evaluation analyzes the results of the 1997 and 1999 CCHE inleakage tests and determined that 523 cfm is the maximum inleakage. This conservatively assumes that the Auxiliary Building ventilation is operating in the high rad mode (exhaust fans on and supply fans off) to maximize the delta p across the CCHE boundary and hence increase the motive force for inleakage. The 523 cfm includes 10 cfm assumed inleakage through doorways for ingress and egress as specified in Regulatory Guide 1.78.

7. Toxicity limit for chlorine = 15 ppm from Regulatory Guide 1.78 (Ref. 2)

IV. ASSUMPTIONS

1. Number of shipping containers failing - 1 - Regulatory Guide 1.78 - Section C.5.a

2. Release height - ground level - actual elevation is not required, only the relative height between the release and receptor affects the calculation.

3. The release is assumed to travel in a straight line from the source to the control complex intake. Conservative assumption.

4. Ambient temperature = Storage Temperature = Ground Temperature = 90.3°F = 32.4°C Basis is Ref. 3 for the actual temperature of 90.3°F which is the maximum daily mean temperature - August. The fact that the storage temperature and ground temperature are the same as the ambient temperature is a reasonable approximation

considering that we are conservatively using the maximum daily mean temperature from the hottest month. Additionally, the ground temperature only affects the evaporation rate for plume concentration. It is the initial puff concentration that controls the control room concentration over the first few minutes when comparisons with the acceptance criteria are made. The puff concentration is independent of ground temperature.

5. No building wake factor is assumed, as there are no major structures near the assumed accident location.

6. Plume meander factors - unlike previous vendor toxic gas calculations, a plume meander factor is not applied as it is already built into the HABIT dispersion model in EXTRAN.

7. Stability Class = F (or 6 in the HABIT code) - Per RG 1.78, atmospheric dispersion should be that which is exceeded only 5% of the time. Stable conditions provide the worst results as they represent the most concentrated plume. G stability would be the worst, followed by F. During the summer months, which are assumed due to the use of maximum temperature to maximize the results; a G stability class exists less than 5% of the time per Table 2-13 of the FSAR. Therefore, G stability does not have to be used per Reg. Guide 1.78. Stability class F exists for well over 5% of the time in the summer and hence will be the assumed stability class.

8. Wind speed = 1 m/sec - Conservative assumption - the lower the wind speed, the higher the concentration. Hence, the lowest, non-calm wind speed was chosen. A review of the 1998 data (REDAS) indicates that the average hourly wind speed is less than 1 m/sec only about 3% of the time.

9. Atmospheric pressure = 760 mm Hg - average value for sea level - does not affect the puff, only the plume generation, which is unimportant in first few minutes when the acceptance criteria is determined.

10. Solar radiation - 1150 watts/m^2 - from NUREG/CR-6210 - highest value for 30° latitude.

11. Cloud cover - 0 - assumed sunny since assumed air temperature is 90°F. This parameter only affects plume generation and not the puff. Plume is not important during first few minutes when the acceptance criteria is determined.

12. Chemical parameters for Chlorine are taken directly from the HABIT chemical data library. They are: Molecular weight 70.9 gm/mole, Heat of vaporization 288 j/gm, Boiling point -34.1°C, Heat capacity 0.946 j/gm-°C, Specific gravity 1.57, Diffusion coefficient 0.079 cm^2/sec.

13. Assumed isolation time - 50 seconds after plume arrival. This is an assumption based on calculated plume concentrations and expected equipment capabilities. The 50 seconds includes the time for the plume concentration to reach concentrations in excess of the trip setpoint, transit time from the intake to the intake monitor detector, monitor response time, built-in monitor time delays and damper

closure time. This 50 second assumption will be used to establish acceptance criteria for monitor response time testing, as presented in the results above.

14. It is conservatively assumed that the intake flow remains at 5700 cfm until the intake damper is fully closed.

15. Nasal detection limit for chlorine is 3.5 ppm. Based on Ref.11.

16. Time for an operator to don SCBA after awareness of toxic gas presence = 2 minutes, per footnote 6 of Reg. Guide 1.78.

V. REFERENCES

1. EMAIL from Dean Karagiorgos - 11/3/99 - Attachment 1
2. Regulatory Guide 1.78 - Rev. 0 "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release", June 1974
3. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Published in 1974, Volume 1 of 'Climate of the States', Page 64
4. FPC Drawing A-102-052
5. Black & Veatch Site Grading Plan Drawing for Project 76-45
6. FSAR - Rev. 26 - Table 2-13 - Crystal River Monthly and Annual Distribution of Stability Categories
7. NUREG/CR-6210 - Computer Codes for Evaluation of Control Room Habitability (HABIT), June 1996, Pacific Northwest Labs
8. FPC Correspondence No. 3F0587-11 from E. C. Simpson to NRC, dated 5/7/87, "Control Room Habitability Sulfur Dioxide Supplement Report".
9. EEF-99-0014 Rev 0 10/11/99 - CCHE Inleakage Test Results Effects on Control Room Habitability Calculations
10. NUREG/CR-3786, "A Review of Regulatory Requirements Governing Control Room Habitability Systems", Mark J. Jacobus, August 1984
11. FPC Calculation M97-0109, Rev. 1 which References "Dangerous Properties of Industrial Materials", N. Irving Sax, Third Edition, 1968
12. FPC Drawing 308-888
13. Tubing Data Swagelok, May 1991 - Attachment 16
14. FPC Procedure PT 366 - TOXIC GAS DETECTION SYSTEM CALIBRATION (TRAIN A), Rev.14
15. FPC Procedure PT 367 - TOXIC GAS DETECTION SYSTEM CALIBRATION (TRAIN B), Rev.12
16. FPC Procedure PT 368 - TOXIC GAS DETECTOR FUNCTIONAL TEST, Rev.6

VI. CALCULATIONS

The calculations were performed using the NRC's HABIT code. In particular, the two codes internal to HABIT that are designed for toxic gas analyses were employed. They are the EXTRAN code, which calculates the concentration at the control room intake given a specified toxic gas release scenario and the CHEM code, which takes the EXTRAN results and calculates the control room concentration. These two codes were verified for CR3 use in safety related calculations (Computer Software No. CS-00-008). Two restrictions were imposed during the HABIT verification. First, the HABIT building wake factors cannot be used. This does not affect this calculation, as due to the location of the accident, there is no building wake effect. The second

restriction is that the results using an elevated receptor can not be used directly. Credit is needed in this calculation for an elevated receptor. As will be discussed below, the EXTRAN code is used to determine concentrations at various elevations in order to determine an effective elevation.

The Design Inputs and Assumptions above are used as inputs to the HABIT code. The methodology employed by the EXTRAN and CHEM codes is described in NUREG/CR-6210.

Step 1 - Determine an effective receptor height.

As given in design input 2, the height of the control complex intake is 20.8 meters above grade and hence above the effective release height of the chlorine container rupture. Figure 1 demonstrates how the HABIT code will calculate unconservative results for an elevated receptor on a building. In reality, the plume will not pass under the receptor, but a significant fraction will be deflected up the wall to the receptor location.

NUREG/CR-3786 (Ref. 10) provides a method for calculating the effective concentration at an elevated receptor location for a heavier than air plume contacting the building wall below the receptor. This method specifies that the plume should be treated as dispersed uniformly in the vertical direction from the ground level to the level of the intake.

The effective concentration corresponding to a uniform vertical dispersion can be determined using EXTRAN. This is accomplished by calculating the concentration at small increments from ground level up to the receptor level for the specific release case being evaluated. Taking the average of these calculated concentrations would thus provide the effective concentration should the available chlorine inventory be equally mixed in the vertical direction up to the receptor height.

Therefore, EXTRAN was run for the specific case as defined by the above design inputs and assumptions, with the exception that the receptor height was varied from 0 meters to 20.8 meters, by 2 meter increments. The EXTRAN results give the calculated concentration at each elevation at the control complex wall, neglecting the effects of wall deflection.
The EXTRAN results for these cases are presented in Attachments 3 through 13. Of course the concentration results in EXTRAN vary as a function of time. To obtain an effective average concentration, the same time period must be used from each result. It was decided to use the time of the maximum or peak concentration. The maximum in each case occurred at either 1.00 minutes or 1.083 minutes. (The two results at these two times were typically very close and which one was higher depended on calculation rounding).

The following are the results for the peak concentration as a function of receptor height (from page 7 of Attachments 3-13):

0 meters - 6030 ppm
2 meters - 5770 ppm
4 meters - 5060 ppm
6 meters - 4070 ppm
8 meters - 3000 ppm

10 meters - 2030 ppm
12 meters - 1260 ppm
14 meters - 723 ppm
16 meters - 380 ppm
18 meters - 184 ppm
20.8 meters - 58 ppm

The average concentration over the above 11 receptor heights is approximately 2600 ppm. Therefore, using a receptor height of 8 meters (concentration = 3000 ppm) in EXTRAN/CHEM will result in calculated control room concentrations equivalent to assuming uniform vertical dispersion per the guidance of NUREG/CR-3786. Note that the use of an effective receptor height of 8 meters is approximately 2 times less conservative than assuming a ground level receptor, but 50 times greater than the EXTRAN results for a 20.8 meter high receptor that neglects the effects of the wall. Note also that use of a somewhat higher concentration, such as 120 ppm, for the final result representative of 20 meters instead of the 58 ppm at 20.8 meters would not increase the calculated average above 3000 ppm.

Therefore, EXTRAN/CHEM will be run with a receptor height of 8 meters to determine the control room concentrations for this accident.

Step 2 - Determine the chlorine concentrations assuming no isolation.

Attachment 14 presents the EXTRAN/CHEM results for the case of no isolation of the 5700 cfm intake flow. As shown on pages 11 and 12 of Attachment 14, the chlorine concentration will reach the nasal detection concentration of 3.5 ppm at 0.667 minutes. Two minutes (the time at which operators can be assumed to be wearing SCBA's) after reaching this concentration, the control room chlorine concentration is 46.4 ppm. This exceeds the toxicity limit of 15 ppm specified in Reg. Guide 1.78. The concentration of 15 ppm is exceeded within 20 seconds of nasal detection. Therefore, the toxicity limit can not be met for this accident without automatic isolation. Figures 2 and 3 present the results of Attachment 14 graphically. Figure 2 shows the concentration at the control complex intake. Figure 3 shows the control room concentration.

Step 3 - Determine the chlorine concentration assuming isolation.

Attachment 15 presents the EXTRAN/CHEM results for the case of isolating the control room intake based on chlorine monitor detection and isolation. The assumed isolation time is 50 seconds after plume arrival. As can be seen on pages 11-13 of Attachment 15, the control room concentration remains less than the toxicity limit of 15 ppm through the 7.5 minutes that the code calculates. This well exceeds the two minute time criteria for donning an SCBA and hence meets the criteria of Reg. Guide 1.78. Figures 2 and 3 present the results of Attachment 15 graphically. Figure 2 shows the concentration at the control complex intake. (Note that the concentration at the control complex intake is independent of isolation. Therefore, the results presented in Figure 2 apply to both Attachments 14 and 15). Figure 3 shows the control room concentration.

Step 4 - Establish Acceptance Criteria for Chlorine Monitor Response Time Testing

The scenario analyzed in Attachment 15 is the bounding scenario for the rate of increase of chlorine at the intake and hence in the control room. The other scenarios analyzed in M-97-0109 (Helper Cooling Tower and CR 4/5) did not require isolation due to distance and volume limitations. The transportation accident analyzed here assumes F stability and 1 m/sec wind speed. All other meteorological conditions would result in a more disperse puff and hence a slower rate of increase in concentration (except for G stability which is too low in probability to be considered per the guidelines and would be within a factor of two of F stability). As can be seen in Figure 3, with this rate of increase, it is necessary that isolation occur within 50 seconds of initial plume arrival. The curve for no isolation shows that at 60 seconds after plume arrival, the control room concentration would already be above the 15 ppm limit.

There are five factors that make up the time delay from plume arrival to dampers closed. They are:

1. The time for the intake concentration to reach a concentration that would cause an alarm/trip signal.
2. The time for the activity in the intake to reach the chlorine detector as the detector relies on an offline sample.
3. The time for the sensor to respond to a given concentration and provide a high alarm signal.
4. The time to convert the high alarm signal to a damper trip signal. This includes a time delay built into the software to prevent trips from spurious electrical signals. Other processing time delays would be insignificant compared to this built-in delay.
5. The time for the dampers to close.

The total of all 5 factors must be less than 50 seconds. Three of the factors will be considered fixed as follows:

Factor 2, the time for the activity to travel from the intake duct to the detector through the sample line will conservatively be assumed to be 2 seconds. This is based on the following:

Length of sample tubing from duct to pump/monitor = approximately 40 ft per drawing 308-888. Confirmed via walkdown by R. Muzzi in March 2000.

Tubing size - 1/4" per drawing 308-888

Tubing thickness - minimum 0.028" per Reference 13

Tubing ID = 0.25 - 2(0.028) = 0.194"

Tubing radius = 0.194/2 = 0.097"

Tubing area = π $(0.097)^2$ = 0.0296 in^2

Sample flow = 10 liters/min - this was determined by empirically testing two WISA pumps that are specified for use in the toxic gas monitoring system. The two pump curves (Attachment 17) both show greater than 10 liters/min with 50" water gauge

pressure. Work Requests 353577 and 353578 show pressures between 29.1 and 49.1" of water. Therefore, the flow should be at least 10 liters/min.

Converting 10 liters/min x 1000 cc/liter x 0.061 in^3/cc x 1/60 min/sec gives

Sample flow = 10.17 in^3/sec

Sample velocity = 10.17 in^3/sec / 0.0296 in^2 = 343.6 in/sec x 1/12 ft/in =
= 28.6 ft/sec.

Time from duct to monitor = 40 ft/28.6 ft/sec = 1.4 sec.

This will be rounded up to 2 seconds to be conservative and account for potential reductions in actual sample flow.

(Note that we could actually neglect this 2 second factor as the estimated time for the intake air to travel from the sample point to the isolation damper is greater than the two seconds to reach the monitor. However, for conservatism it will be included).

Factor 4, the signal processing time will be taken to be 3 seconds This is based on the fact that the time delay is set between 2 and 3 seconds per procedures PT 366, PT 367 and PT 368.

Factor 5, the time for damper closure, will be conservatively assumed as 10 seconds. This is based on a review of PT366 results. Seventeen performances were reviewed since the dampers were modified in Outage 11D. The shortest damper closure time was 6 seconds and the longest was 10 seconds. The average closure time was 8 seconds. To be conservative, a time of 10 seconds is chosen. Note that the analysis does not take credit for reduced intake flow while the dampers are closing.

The total of factors 2, 4 and 5 is 15 seconds. That leaves a total of 35 seconds for factors 1 and 3. These two factors are inter-related as it depends on what concentration is chosen. The higher the concentration the longer it will take for the intake concentration to reach that level, however, the detector response time will be quicker.

In the past, only one acceptance criterion was provided which was based on establishing the concentration for determining the acceptance criterion at slightly above the monitor high alarm setpoint. The monitor high alarm setpoint is set at 5 ppm per Procedure PT-366 and PT-367. Hence, the time response testing was performed at concentrations approximately twice this level. Figure 4 provides an expanded scale version of Figure 2 for the fist 20 seconds from plume arrival. It shows that a concentration of 10-15 ppm in the intake (Factor 1) is reached at 10 seconds post plume arrival. This leaves 25 seconds for detector response time to reach the high alarm signal.

This is not the only possible test and acceptance criterion. A higher test concentration could be used. Any of the following acceptance criteria could be used:

1. Test concentration: 13.3 ppm
   Time to reach in intake - 10 seconds
   Acceptable sensor response time to high alarm signal - 25 seconds

2. Test concentration: 40 ppm
   Time to reach in intake - 15 seconds
   Acceptable sensor response to high alarm signal - 20 seconds

3. Test concentration: 100 ppm
   Time to reach in intake - 20 seconds
   Acceptable sensor response to high alarm signal - 15 seconds

   Only one of these acceptance criteria has to be demonstrated, not all three. For this scenario, it is a given that the intake concentration will be 100 ppm within 10 seconds of reaching 13.3 ppm. If the plume was not as concentrated and hence not increasing in concentration as fast as shown in Figures 2 and 4, then the concentration in the control room would be increasing at a comparably slower rate. An overall damper closure time greater than 50 seconds would be acceptable. The scenario chosen presents the shortest acceptable isolation time and places the most challenge on detector response capability. For scenarios where the intake concentration never exceeds a few hundred ppm, there will be significantly longer than 2 minutes to don SCBA's after nasal detection.

   Hence, a response time test procedure could select whichever of the above acceptance criteria is more practical.

Step 5 - Justify not performing as-found time response testing.

Attachment 18 presents the results of a chlorine sensor time response test. The test was performed by applying a test concentration of 6 ppm. As can be seen from the results, the detector will reach 5% of the actual concentration within 6 seconds. Therefore, if the actual concentration were 100 ppm, the detector would reach the alarm setpoint of 5 ppm within 6 seconds. This is well within the acceptable response time of 15 seconds calculated in Step 4 above. (This assessment is conservative as the rate of percentage increase is expected to be greater with higher concentrations and the calculated intake concentration is continuing to increase with time).

Present testing of the toxic gas monitors is performed in PT368, monthly functional, and PT366 or PT367, quarterly calibration. The monthly functional inspects the monitors for connection and tubing problems. The sensors are removed, inspected, weighed and water added to return them to original weight. The zero is adjusted to trip the control complex dampers.

The calibration is performed quarterly and includes all items in the monthly functional. In addition a full calibration is performed on the monitors. An "As-Left" time response is performed and the total time must be less than 40 seconds for

the chlorine sensors with 13.3 ppm applied. An "As-Found" time response is performed if there is any toxic gas stored at the Helper Cooling Towers.

Not performing "As-Found" time response testing for a one ton chlorine transportation accident is based on the expectation that all sensor failures will be caught by the other testing. The sensors that were marginal and failed the "As-Found" time response tests in the past would have easily responded to the 100 ppm gas that they would be exposed to 10 seconds after being exposed to 13.3 ppm. With that level of concentration applied the sensor only has to reach 4.5% of the concentration level to trip.

VII. ATTACHMENTS

1. EMAIL from Dean Karagiorgos - 11/3/99 - Shipment Frequency to CR 4/5
2. Section of Black & Veatch site plan drawing
3. EXTRAN Results - Chlorine Transportation Accident - 0 meter receptor
4. EXTRAN Results - Chlorine Transportation Accident - 2 meter receptor
5. EXTRAN Results - Chlorine Transportation Accident - 4 meter receptor
6. EXTRAN Results - Chlorine Transportation Accident - 6 meter receptor
7. EXTRAN Results - Chlorine Transportation Accident - 8 meter receptor
8. EXTRAN Results - Chlorine Transportation Accident - 10 meter receptor
9. EXTRAN Results - Chlorine Transportation Accident - 12 meter receptor
10. EXTRAN Results - Chlorine Transportation Accident - 14 meter receptor
11. EXTRAN Results - Chlorine Transportation Accident - 16 meter receptor
12. EXTRAN Results - Chlorine Transportation Accident - 18 meter receptor
13. EXTRAN Results - Chlorine Transportation Accident - 20.8 meter receptor
14. EXTRAN/CHEM Results - Chlorine Transportation Accident - No isolation
15. EXTRAN/CHEM Results - Chlorine Transportation Accident - 50 sec. Isolation
16. Swagelok tube dimensions
17. Toxic Gas Sample Pump Curves
18. Chlorine Sensor Time Response Test Results

DOCUMENT IDENTIFICATION NO.	REVISION
M-00-0002 – Addendum 1	1

I. PURPOSE

The purpose of Addendum 1 is to evaluate additional cases with higher inleakage following isolation than analyzed in Rev. 0. This is required due to the proposed license amendment using the Alternative Source Term, which is justifying a higher inleakage rate for radiological calculations.

II. RESULTS/CONCLUSIONS

Assuming automatic isolation at 48 seconds after plume arrival, the chlorine concentration 2 minutes after nasal detection is within the 15 ppm limit. The results related to detector response time in Rev. 0 remain valid.

III. DESIGN INPUTS

All design inputs are the same as Revision 0 except for:

1. The inleakage rate after isolation. The new inleakage rate is calculated below.

2. The time to isolation will now be assumed to be 0.0133 hrs instead of 0.014 hrs as assumed in Rev. 0. As noted on Page 8 of Revision 0, there is an assumed 2 seconds built into the assumed isolation time from the monitor. This time accounts for the time for the sample to travel from the sample point to the detector. It was noted that this 2 seconds could be neglected as it takes longer than 2 seconds for the intake air to travel from the sample point to the isolation damper. This can be confirmed by drawing BS-311-718. The distance from the sample point to the first isolation damper (AHD-1E) is approximately 30 ft. The smallest duct size in this run is 30"x44". The intake flow rate is 5700 cfm. Therefore, the air velocity is:

   5700 cfm / ((30/12) x (44/12)) = 622 ft/min = 10.4 ft/sec

   Therefore, the time to travel 30 ft. is approximately 2.9 seconds

   In Revision 0, this 2 seconds was not neglected for conservatism. In this Addendum, the 2 seconds will be neglected. Hence, the effective isolation time is 48 seconds. This is:

   48 sec / 3600 sec/hr = 0.0133 hrs

IV. ASSUMPTIONS

All assumptions are the same as Revision 0 except for the assumed negative pressure across the control complex, which affects the assumed inleakage rate as calculated below.

V. REFERENCES

The references from Rev. 0 remain valid. The following are added:

17. FPC Calculation N-00-0002, Rev. 0 - Public and Control Room Dose from a LOCA using the Alternative Source Term

18. FPC Calculation M-97-0137, Rev. 5 - Control Room Habitability Analysis Considering LOCA without LOOP.

19. Gilbert Associates Letter FPC-13219, dated November 26, 1975

VI. CALCULATION

The purpose of this Addendum is to evaluate the chlorine concentration assuming higher inleakage rates after isolation. From calculation N-00-0002, the inleakage rate, with the maximum 50 in^2 breach open, is assumed to be as high as 1400 cfm for the radiological evaluations.

This 1400 cfm would only exist under the maximum delta p conditions across the CCHE boundary. This maximum delta p is 0.2" water gauge and would only exist with the auxiliary building ventilation in the high rad mode, i.e. - the exhaust fans on and the supply fans tripped from a high rad condition. For a toxic gas event, the supply fans will not trip and therefore, the delta p across the CCHE/AB boundary will only be at the maximum normal AB negative pressure of 0.125" water gauge. (Per Reference 19, the recommended AB pressure was "any measurable negative pressure, preferably in the range 0.05 to 0.125 inches of water." The engineers responsible for AB ventilation stated that negative pressure is maintained, but typically much less than 0.125 inches of water. Figure 1 attached is plotted from the AB delta p measured daily by the operator during SP-300 rounds. It demonstrates, at least for the last month, that the AB pressure is typically much less than 0.125 inches of water and never exceeded that value.)

This difference in delta p will be used to calculate the inleakage flow at the lower delta p. Per calculation M-97-0137 (Pgs 8 and 9), when extrapolating to lower pressure differentials, it is conservative to ratio the leakage rates to the ratio of the differential pressures raised to the power of 0.5. Therefore:

Flow at 0.125" = Flow at 0.2" $(0.125/0.2)^{0.5}$ = 1400 cfm x 0.791 = 1107 cfm

Therefore, HABIT was rerun with the same inputs as Attachment 15, with the following changes:

1. The second time step was changed from 0.014 hr to 0.0133 hr
2. The unfiltered intake starting with the second time step was changed from 523 cfm to 1107 cfm.
3. The exhaust flow rate for the second time step also changed from 523 cfm to 1107 cfm.

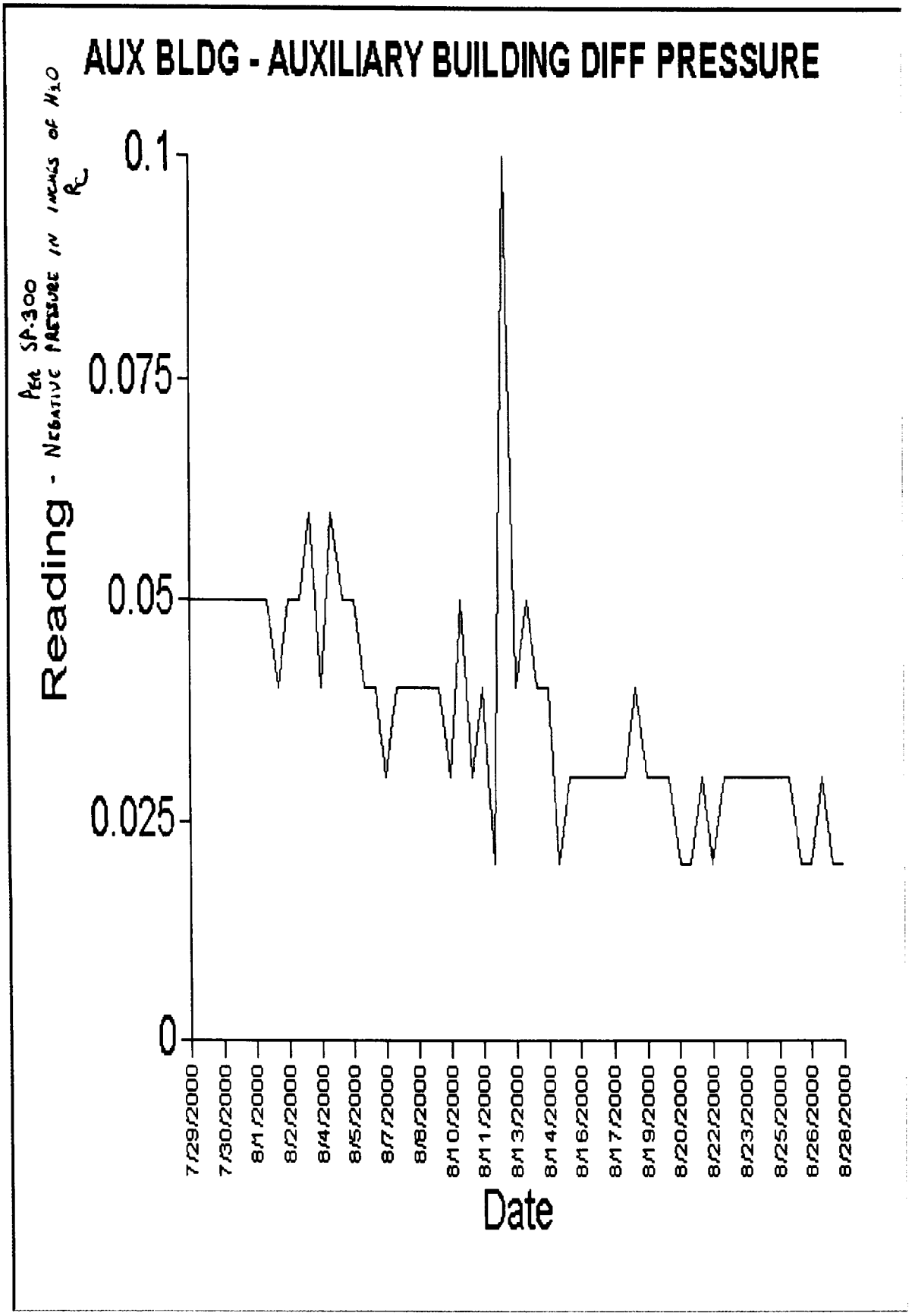
Attachment 19 presents the results for this HABIT evaluation. At 0.667 min, the nasal detection concentration of 3.5 ppm is reached. Two minutes later, at 2.667 minutes, the concentration is 14.15 ppm. This is within the 15 ppm limit and is therefore acceptable.

VII. ATTACHMENTS

Attachments 1-18 remain valid. There is one new Attachment.

19. HABIT - EXTRAN/CHEM Results - Chlorine Transportation Accident - 48 sec isolation and 1107 cfm inleakage.

FIGURE 1


AUX BLDG - AUXILIARY BUILDING DIFF PRESSURE
Reading - Negative Pressure in inches of H2O per SP-300
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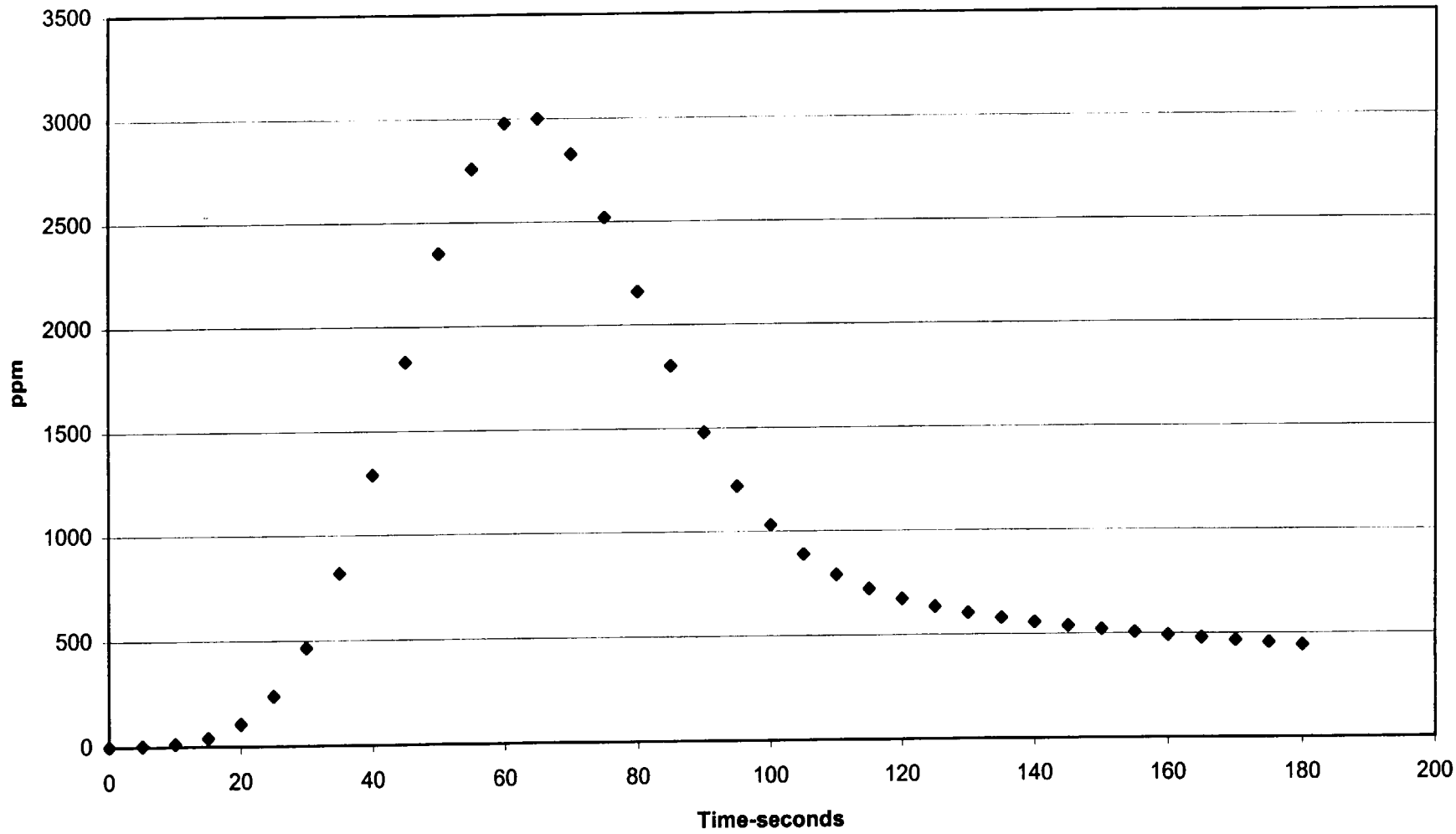
0.075
0.05
0.025
0
7/29/2000
7/30/2000
8/1/2000
8/2/2000
8/4/2000
8/5/2000
8/7/2000
8/8/2000
8/10/2000
8/11/2000
8/13/2000
8/14/2000
8/16/2000
8/17/2000
8/19/2000
8/20/2000
8/22/2000
8/23/2000
8/25/2000
8/26/2000
8/28/2000
Date

Figure 2
Chlorine concentration in CC Duct
Assuming 1 ton tank failure at intersection of road to CR 4/5

M 00-0002
Rev. 0



M 00-0002
Rev. 0

Figure 3
Control Room Chlorine Concentration
Assuming 1 ton tank failure at intersection of road to CR 4/5

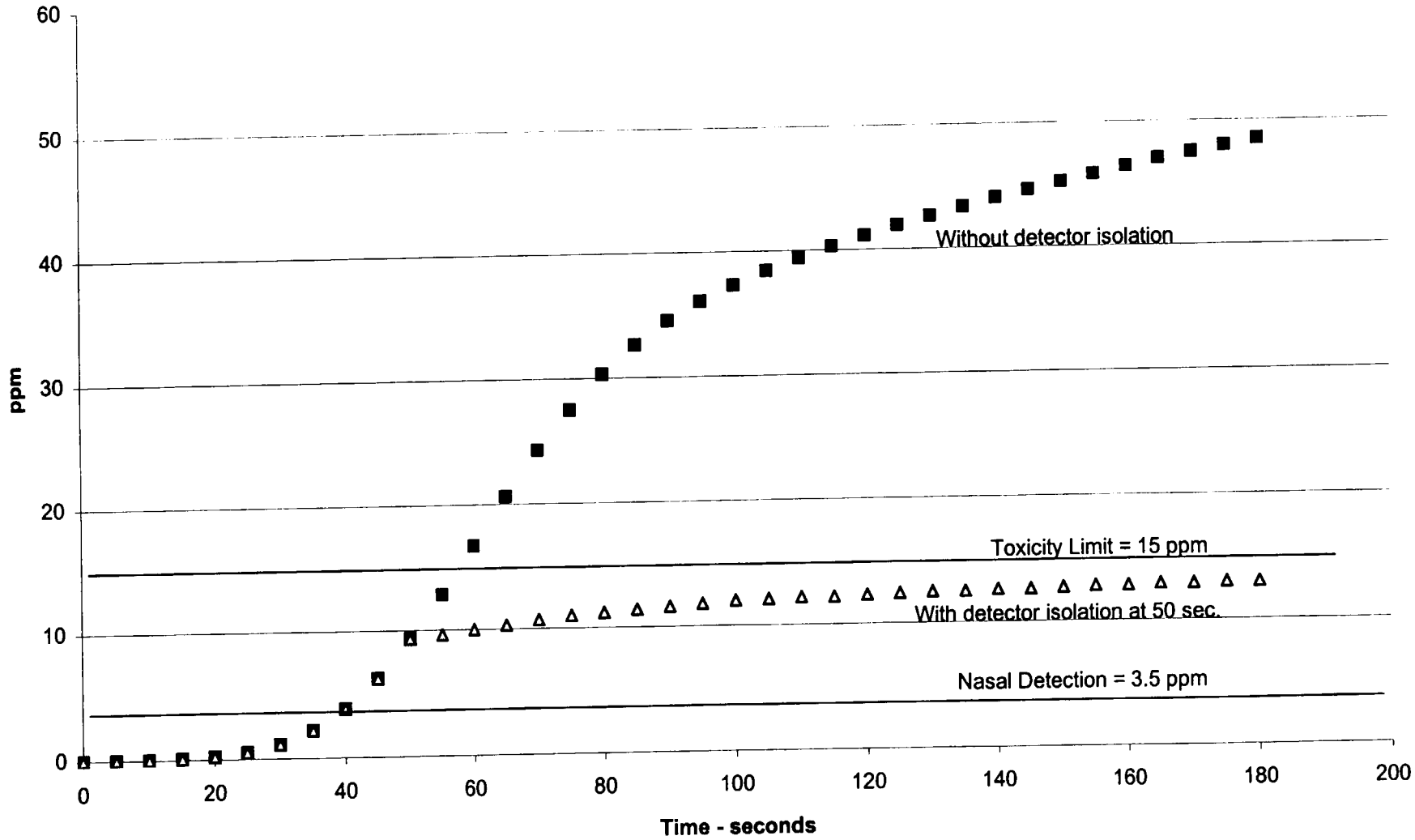


Figure 4
Intake Duct Chlorine Concentration
First 20 seconds

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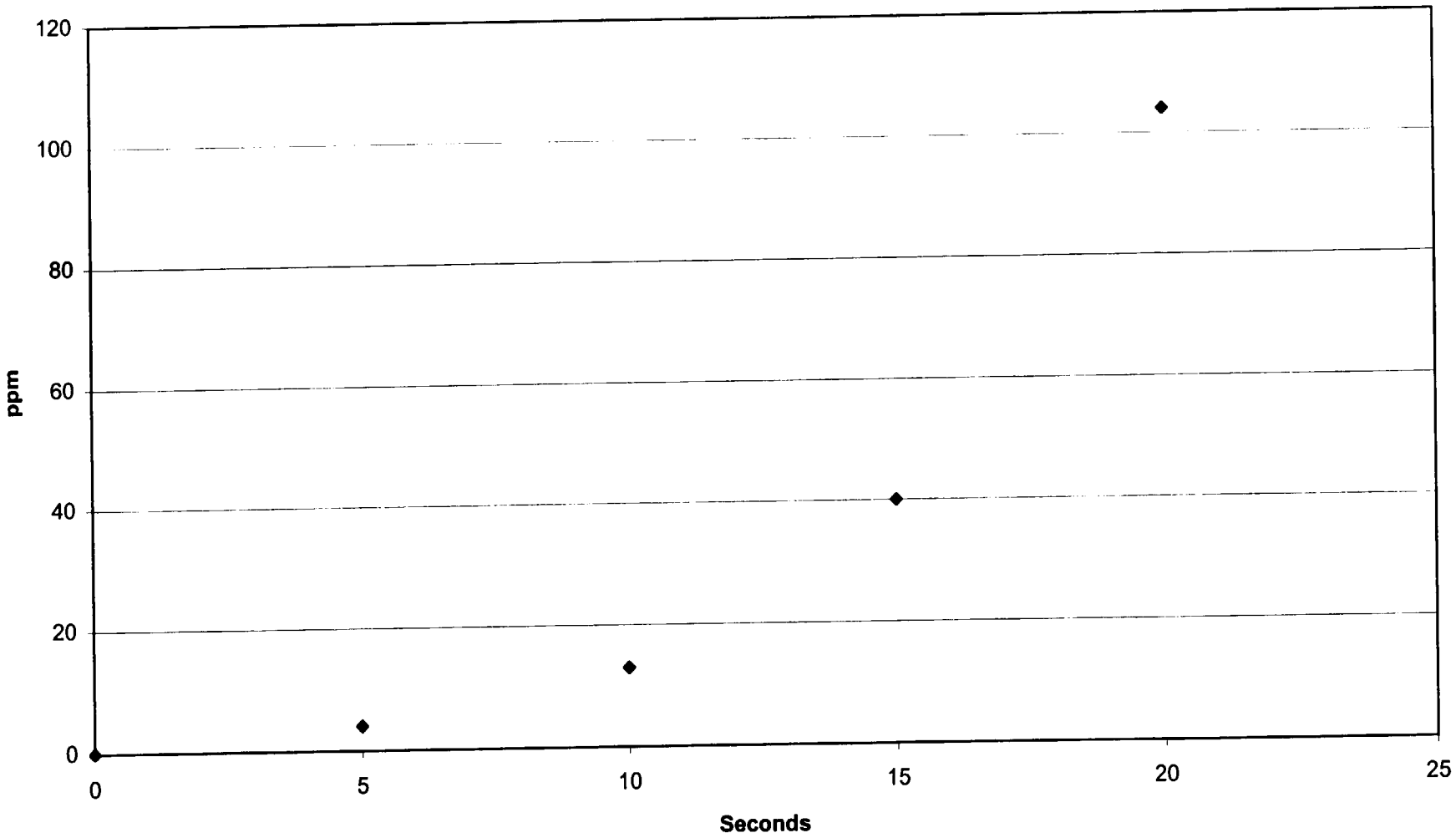
Rev. 0



M-00-0002 120
ATTACHMENT 1

Crandall, Raymond A. /cr

From: MUZZI, ROBERT L. /cr
Sent: Tuesday, November 23, 1999 11:28 AM
To: Crandall, Raymond A. /cr; ANDERSON, KENNETH L. /cr
Subject: FW: RE: Shipment Frequency to CR4/5 Cooling Towers

-----Original Message-----
From: Karagiorgos, Dean K. /cr
Sent: Wednesday, November 03, 1999 2:58 PM
To: MUZZI, ROBERT L. /cr
Subject: RE: Shipment Frequency to CR4/5 Cooling Towers

Robert,
4- one ton cylinders(8,000 LBS) every 7-days. - CLARIFICATION BY PHONE INDICATED THAT THIS IS THE FREQUENCY FOR CHLORINE. SO2 IS ONLY SHIPPED ONCE/TWO MONTHS AND HENCE IS NOT CONSIDERED A FREQUENT SHIPMENT PER RG 1.78 CRITERIA

Dean Karagiorgos

R.A. Crandall

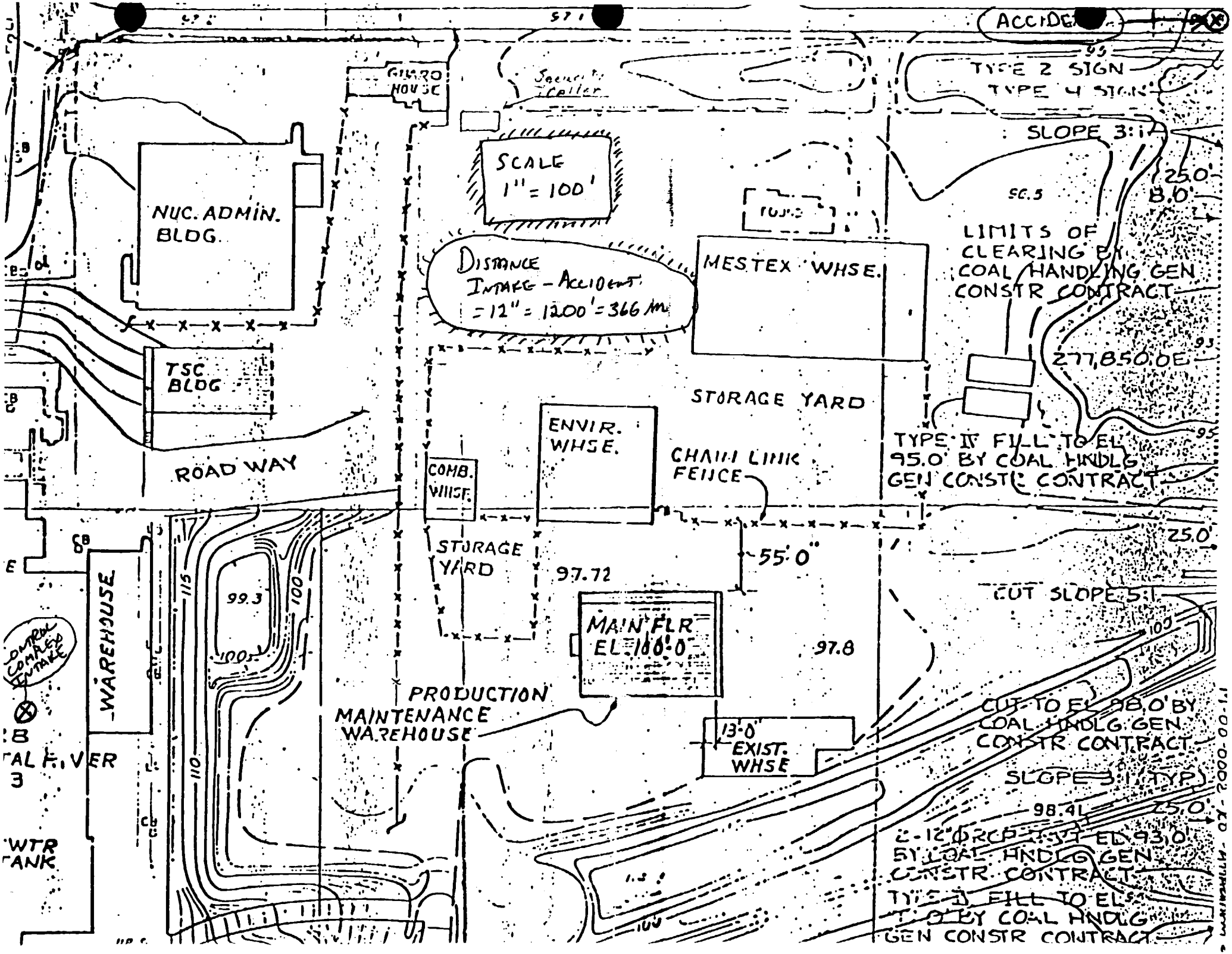
-----Original Message-----
From: MUZZI, ROBERT L. /cr
Sent: Wednesday, November 03, 1999 10:58 AM
To: Karagiorgos, Dean K. /cr
Cc: MUZZI, ROBERT L. /cr
Subject: Shipment Frequency to CR4/5 Cooling Towers

Dean,

I am trying to justify turning off the CR-3 toxic gas monitors whnever there is no toxic gas stored at the Helper Cooling Towers. To do this I need to address the frequency that the one ton chlorine and sulfur dioxide containers are brought to the CR4/5 cooling towers. I would also like to know the quantity of containers received each shipment. I would appreciate any assistance you can give me on this.

Thanks

Bob x3430


ACCIDENT
TYPE 2 SIGN
TYPE 4 SIGN
SLOPE 3:1
25.0
8.0
SCALE
1" = 100'
NUC. ADMIN. BLDG.
GUARD HOUSE
DISTANCE
INTAKE - ACCIDENT
= 12" = 1200' = 366 m
MESTEX WHSE.
LIMITS OF CLEARING BY COAL HANDLING GEN CONSTR CONTRACT
277,850.0E
TSC BLDG
STORAGE YARD
ENVIR. WHSE.
COMB. WHSE.
CHAIN LINK FENCE
TYPE II FILL TO EL 95.0 BY COAL HNDLG GEN CONSTR CONTRACT
ROAD WAY
STORAGE YARD
97.72
55'0"
25.0
CUT SLOPE 5:1
MAIN FLR EL 100'0"
97.8
WAREHOUSE
99.3
100
115
110
PRODUCTION MAINTENANCE WAREHOUSE
13'0"
EXIST. WHSE
CUT TO EL 98.0' BY COAL HNDLG GEN CONSTR CONTRACT
SLOPE 3:1 TYP.
98.4
25.0
2-12" Ø RCP 1ST EL 93.0 BY COAL HNDLG GEN CONSTR CONTRACT
TYP. 3 FILL TO EL BY COAL HNDLG GEN CONSTR CONTRACT

M-00-0002 R0
ATTACHMENT 3

RUN TRNCL - CHLORINE TRANS. ACCIDENT - GROUND LEVEL RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:19:39

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	3.67E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	2.61E+03
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	9.22E+02
Time From Plume Arrival to Max. Conc.	(sec)	=	60.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	6.03E+03

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRNCLEX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRNCLEX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRNCLEX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRNCLEX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRNCLEX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:19:39"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

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2.0000, 14, .00, .00, 511.00, .00, 8.65, .33, 3.25, 33.10, .01, -34.10, 1035.00, 217.00, 444.89, 5832.44, 7529.32

2.1667, 15, .00, .00, 502.73, .00, 8.27, .33, 3.22, 32.55, .01, -34.10, 1035.00, 217.00, 444.89, 5620.28, 7317.16

2.3333, 16, .00, .00, 494.81, .00, 7.92,

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444.89,    5429.70,     7126.59
    2.5000,  17,          .00,         .00,     487.20,         .00,        7.61,
.32,        3.17,       31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,     6954.17
    2.6667,  18,          .00,         .00,     479.88,         .00,        7.32,
.31,        3.14,       31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,     6797.20
    2.8333,  19,          .00,         .00,     472.81,         .00,        7.06,
.31,        3.12,       30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,     6653.50
    3.0000,  20,          .00,         .00,     465.99,         .00,        6.82,
.30,        3.10,       30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,     6521.30
    3.1667,  21,          .00,         .00,     459.40,         .00,        6.59,
.30,        3.07,       29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,     6399.15
    3.3333,  22,          .00,         .00,     453.01,         .00,        6.39,
.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,     6285.82
    3.5000,  23,          .00,         .00,     446.82,         .00,        6.19,
.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
    3.6667,  24,          .00,         .00,     440.81,         .00,        6.01,
.28,        3.01,       28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,     6081.77
    3.8333,  25,          .00,         .00,     434.97,         .00,        5.84,
.28,        2.99,       28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,     5989.44
    4.0000,  26,          .00,         .00,     429.29,         .00,        5.68,
.28,        2.97,       27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,     5902.72
    4.1667,  27,          .00,         .00,     423.77,         .00,        5.53,
.27,        2.95,       27.34,        .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,     5821.04
    4.3333,  28,          .00,         .00,     418.38,         .00,        5.38,
.27,        2.93,       26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,     5743.95
    4.5000,  29,          .00,         .00,     413.14,         .00,        5.25,
.27,        2.91,       26.65,        .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,     5671.02
    4.6667,  30,          .00,         .00,     408.02,         .00,        5.12,
.26,        2.89,       26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,     5601.90
    4.8333,  31,          .00,         .00,     403.02,         .00,        5.00,
.26,        2.88,       25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,     5536.27
    5.0000,  32,          .00,         .00,     398.14,         .00,        4.88,
.26,        2.86,       25.67,        .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,     5473.83
    5.1667,  33,          .00,         .00,     393.38,         .00,        4.77,
.25,        2.84,       25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,     5414.35
    5.3333,  34,          .00,         .00,     388.71,         .00,        4.66,
.25,        2.82,       25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,     5357.59
    5.5000,  35,          .00,         .00,     384.16,         .00,        4.56,
.25,        2.81,       24.76,        .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,     5303.36
    5.6667,  36,          .00,         .00,     379.69,         .00,        4.46,
.24,        2.79,       24.47,        .01,     -34.10,    1035.00,     217.00,
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444.89, 3554.57, 5251.46
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.24, 2.77, 24.18, .01, -34.10, 1035.00, 217.00,
444.89, 3504.86, 5201.74
6.0000, 38, .00, .00, 371.05, .00, 4.28,
.24, 2.76, 23.91, .01, -34.10, 1035.00, 217.00,
444.89, 3457.17, 5154.06
6.1667, 39, .00, .00, 366.86, .00, 4.19,
.24, 2.74, 23.63, .01, -34.10, 1035.00, 217.00,
444.89, 3411.38, 5108.26
6.3333, 40, .00, .00, 362.75, .00, 4.11,
.23, 2.73, 23.37, .01, -34.10, 1035.00, 217.00,
444.89, 3367.36, 5064.25
6.5000, 41, .00, .00, 358.72, .00, 4.03,
.23, 2.71, 23.10, .01, -34.10, 1035.00, 217.00,
444.89, 3325.00, 5021.89
6.6667, 42, .00, .00, 354.77, .00, 3.95,
.23, 2.70, 22.85, .01, -34.10, 1035.00, 217.00,
444.89, 3284.20, 4981.09
6.8333, 43, .00, .00, 350.89, .00, 3.88,
.23, 2.68, 22.60, .01, -34.10, 1035.00, 217.00,
444.89, 3244.87, 4941.75
7.0000, 44, .00, .00, 347.08, .00, 3.81,
.22, 2.67, 22.35, .01, -34.10, 1035.00, 217.00,
444.89, 3206.91, 4903.80
7.1667, 45, .00, .00, 343.35, .00, 3.74,
.22, 2.65, 22.11, .01, -34.10, 1035.00, 217.00,
444.89, 3170.26, 4867.15
7.3333, 46, .00, .00, 339.68, .00, 3.67,
.22, 2.64, 21.87, .01, -34.10, 1035.00, 217.00,
444.89, 3134.84, 4831.73
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.22, 2.62, 21.64, .01, -34.10, 1035.00, 217.00,
444.89, 3100.58, 4797.47
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.21, 2.61, 21.41, .01, -34.10, 1035.00, 217.00,
444.89, 3067.42, 4764.30
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.21, 2.60, 21.18, .01, -34.10, 1035.00, 217.00,
444.89, 3035.30, 4732.18
8.0000, 50, .00, .00, 325.63, .00, 3.42,
.21, 2.58, 20.96, .01, -34.10, 1035.00, 217.00,
444.89, 3004.16, 4701.05
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.21, 2.57, 20.74, .01, -34.10, 1035.00, 217.00,
444.89, 2973.97, 4670.86
8.3333, 52, .00, .00, 318.96, .00, 3.31,
.21, 2.56, 20.53, .01, -34.10, 1035.00, 217.00,
444.89, 2944.67, 4641.56
8.5000, 53, .00, .00, 315.71, .00, 3.25,
.20, 2.54, 20.32, .01, -34.10, 1035.00, 217.00,
444.89, 2916.22, 4613.10
8.6667, 54, .00, .00, 312.50, .00, 3.20,
.20, 2.53, 20.11, .01, -34.10, 1035.00, 217.00,
444.89, 2888.58, 4585.46
8.8333, 55, .00, .00, 309.35, .00, 3.15,
.20, 2.52, 19.90, .01, -34.10, 1035.00, 217.00,
444.89, 2861.70, 4558.59
9.0000, 56, .00, .00, 306.25, .00, 3.10,
.20, 2.50, 19.70, .01, -34.10, 1035.00, 217.00,
444.89, 2835.57, 4532.46

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    9.1667,  57,       .00,       .00,    303.20,       .00,      3.05,
.20,       2.49,     19.51,       .01,    -34.10,   1035.00,    217.00,
444.89,    2810.14,   4507.02
    9.3333,  58,       .00,       .00,    300.19,       .00,      3.01,
.19,       2.48,     19.31,       .01,    -34.10,   1035.00,    217.00,
444.89,    2785.38,   4482.27
    9.5000,  59,       .00,       .00,    297.23,       .00,      2.96,
.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
444.89,    2761.26,   4458.15
    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
    9.8333,  61,       .00,       .00,    291.45,       .00,      2.87,
.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
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.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"

"HABIT release design specification file 14:10:53 11-15-1999
"

"
"

"Run on 2/17/2000 at 08:19:39"

"TIME",	"CONCENTRATION"	"EXPOSURE",	"MEAN CONC.",	"NUM OF PUFFS"
"(min)",	"(ppm)",	"(g-sec/m**3)",	"(ppm)"	
.000,	2.08E+00,	2.94E-02,	2.08E+00,	32
.083,	8.90E+00,	1.55E-01,	5.49E+00,	32
.167,	3.06E+01,	5.88E-01,	1.39E+01,	33
.250,	9.04E+01,	1.87E+00,	3.30E+01,	33
.333,	2.31E+02,	5.13E+00,	7.25E+01,	34
.417,	5.14E+02,	1.24E+01,	1.46E+02,	34
.500,	1.01E+03,	2.66E+01,	2.69E+02,	35
.583,	1.75E+03,	5.14E+01,	4.54E+02,	35
.667,	2.72E+03,	8.98E+01,	7.06E+02,	36
.750,	3.81E+03,	1.44E+02,	1.02E+03,	36
.833,	4.84E+03,	2.12E+02,	1.36E+03,	37
.917,	5.62E+03,	2.91E+02,	1.72E+03,	37
1.000,	6.03E+03, MAX	3.77E+02,	2.05E+03,	38
1.083,	6.02E+03,	4.62E+02,	2.33E+03,	38
1.167,	5.64E+03,	5.41E+02,	2.55E+03,	39
1.250,	5.01E+03,	6.12E+02,	2.71E+03,	39
1.333,	4.29E+03,	6.73E+02,	2.80E+03,	40
1.417,	3.59E+03,	7.24E+02,	2.84E+03,	40
1.500,	2.97E+03,	7.66E+02,	2.85E+03,	41
1.583,	2.48E+03,	8.01E+02,	2.83E+03,	41
1.667,	2.11E+03,	8.31E+02,	2.80E+03,	42
1.750,	1.85E+03,	8.57E+02,	2.75E+03,	42
1.833,	1.66E+03,	8.80E+02,	2.71E+03,	43
1.917,	1.52E+03,	9.02E+02,	2.66E+03,	43
2.000,	1.42E+03,	9.22E+02,	2.61E+03,	44
2.083,	1.35E+03,	9.41E+02,	2.56E+03,	44
2.167,	1.29E+03,	9.59E+02,	2.51E+03,	45
2.250,	1.24E+03,	9.77E+02,	2.47E+03,	45
2.333,	1.19E+03,	9.94E+02,	2.42E+03,	46
2.417,	1.15E+03,	1.01E+03,	2.38E+03,	46
2.500,	1.12E+03,	1.03E+03,	2.34E+03,	47
2.583,	1.08E+03,	1.04E+03,	2.30E+03,	47
2.667,	1.05E+03,	1.06E+03,	2.26E+03,	48
2.750,	1.02E+03,	1.07E+03,	2.23E+03,	48
2.833,	9.97E+02,	1.08E+03,	2.19E+03,	49
2.917,	9.72E+02,	1.10E+03,	2.16E+03,	49
3.000,	9.49E+02,	1.11E+03,	2.12E+03,	50
3.083,	9.27E+02,	1.12E+03,	2.09E+03,	50
3.167,	9.06E+02,	1.14E+03,	2.06E+03,	51
3.250,	8.87E+02,	1.15E+03,	2.03E+03,	51
3.333,	8.68E+02,	1.16E+03,	2.00E+03,	52
3.417,	8.50E+02,	1.17E+03,	1.98E+03,	52
3.500,	8.33E+02,	1.19E+03,	1.95E+03,	53
3.583,	8.17E+02,	1.20E+03,	1.93E+03,	53
3.667,	8.02E+02,	1.21E+03,	1.90E+03,	54
3.750,	7.87E+02,	1.22E+03,	1.88E+03,	54

3.833,	7.73E+02,	1.23E+03,	1.85E+03,	55
3.917,	7.60E+02,	1.24E+03,	1.83E+03,	55
4.000,	7.47E+02,	1.25E+03,	1.81E+03,	56
4.083,	7.34E+02,	1.26E+03,	1.79E+03,	56
4.167,	7.22E+02,	1.27E+03,	1.77E+03,	57
4.250,	7.11E+02,	1.28E+03,	1.74E+03,	57
4.333,	6.99E+02,	1.29E+03,	1.73E+03,	58
4.417,	6.89E+02,	1.30E+03,	1.71E+03,	58
4.500,	6.78E+02,	1.31E+03,	1.69E+03,	59
4.583,	6.68E+02,	1.32E+03,	1.67E+03,	59
4.667,	6.58E+02,	1.33E+03,	1.65E+03,	60
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4.833,	6.40E+02,	1.35E+03,	1.62E+03,	61
4.917,	6.31E+02,	1.36E+03,	1.60E+03,	61
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5.333,	5.90E+02,	1.40E+03,	1.52E+03,	64
5.417,	5.83E+02,	1.41E+03,	1.51E+03,	64
5.500,	5.76E+02,	1.42E+03,	1.50E+03,	65
5.583,	5.68E+02,	1.43E+03,	1.48E+03,	65
5.667,	5.62E+02,	1.43E+03,	1.47E+03,	66
5.750,	5.55E+02,	1.44E+03,	1.46E+03,	66
5.833,	5.48E+02,	1.45E+03,	1.44E+03,	67
5.917,	5.42E+02,	1.46E+03,	1.43E+03,	67
6.000,	5.36E+02,	1.46E+03,	1.42E+03,	68
6.083,	5.29E+02,	1.47E+03,	1.41E+03,	68
6.167,	5.24E+02,	1.48E+03,	1.39E+03,	69
6.250,	5.18E+02,	1.49E+03,	1.38E+03,	69
6.333,	5.12E+02,	1.49E+03,	1.37E+03,	70
6.417,	5.06E+02,	1.50E+03,	1.36E+03,	70
6.500,	5.01E+02,	1.51E+03,	1.35E+03,	71
6.583,	4.96E+02,	1.51E+03,	1.34E+03,	71
6.667,	4.90E+02,	1.52E+03,	1.33E+03,	72
6.750,	4.85E+02,	1.53E+03,	1.32E+03,	72
6.833,	4.80E+02,	1.54E+03,	1.31E+03,	73
6.917,	4.75E+02,	1.54E+03,	1.30E+03,	73
7.000,	4.70E+02,	1.55E+03,	1.29E+03,	74
7.083,	4.66E+02,	1.56E+03,	1.28E+03,	74
7.167,	4.61E+02,	1.56E+03,	1.27E+03,	75
7.250,	4.57E+02,	1.57E+03,	1.26E+03,	75
7.333,	4.52E+02,	1.57E+03,	1.25E+03,	76
7.417,	4.48E+02,	1.58E+03,	1.24E+03,	76
7.500,	4.43E+02,	1.59E+03,	1.23E+03,	77

MDD-0002 Rev
ATT 4

RUN TRC02 - CHLORINE TRANS ACCIDENT - 2 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:25:30

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	2.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	3.66E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	2.49E+03
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	8.82E+02
Time From Plume Arrival to Max. Conc.	(sec)	=	60.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	5.77E+03

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC02EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC02EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC02EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC02EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC02EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:25:30"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

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.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
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    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
    9.8333,  61,       .00,       .00,    291.45,       .00,      2.87,
.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
   10.6667,  66,       .00,       .00,    277.71,       .00,      2.67,
.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
```

.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:25:30"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	1.97E+00,	2.79E-02,	1.97E+00,	32
.083,	8.44E+00,	1.47E-01,	5.20E+00,	32
.167,	2.90E+01,	5.58E-01,	1.31E+01,	33
.250,	8.59E+01,	1.77E+00,	3.13E+01,	33
.333,	2.19E+02,	4.88E+00,	6.90E+01,	34
.417,	4.89E+02,	1.18E+01,	1.39E+02,	34
.500,	9.59E+02,	2.53E+01,	2.56E+02,	35
.583,	1.67E+03,	4.89E+01,	4.33E+02,	35
.667,	2.59E+03,	8.56E+01,	6.73E+02,	36
.750,	3.63E+03,	1.37E+02,	9.69E+02,	36
.833,	4.62E+03,	2.02E+02,	1.30E+03,	37
.917,	5.38E+03,	2.78E+02,	1.64E+03,	37
1.000,	5.77E+03, MAX	3.60E+02,	1.96E+03,	38
1.083,	5.76E+03,	4.41E+02,	2.23E+03,	38
1.167,	5.40E+03,	5.18E+02,	2.44E+03,	39
1.250,	4.80E+03,	5.86E+02,	2.59E+03,	39
1.333,	4.11E+03,	6.44E+02,	2.68E+03,	40
1.417,	3.43E+03,	6.92E+02,	2.72E+03,	40
1.500,	2.85E+03,	7.33E+02,	2.73E+03,	41
1.583,	2.37E+03,	7.66E+02,	2.71E+03,	41
1.667,	2.02E+03,	7.95E+02,	2.68E+03,	42
1.750,	1.76E+03,	8.20E+02,	2.63E+03,	42
1.833,	1.58E+03,	8.42E+02,	2.59E+03,	43
1.917,	1.45E+03,	8.63E+02,	2.54E+03,	43
2.000,	1.36E+03,	8.82E+02,	2.49E+03,	44
2.083,	1.29E+03,	9.00E+02,	2.45E+03,	44
2.167,	1.23E+03,	9.17E+02,	2.40E+03,	45
2.250,	1.18E+03,	9.34E+02,	2.36E+03,	45
2.333,	1.14E+03,	9.50E+02,	2.32E+03,	46
2.417,	1.10E+03,	9.65E+02,	2.28E+03,	46
2.500,	1.06E+03,	9.81E+02,	2.24E+03,	47
2.583,	1.03E+03,	9.95E+02,	2.20E+03,	47
2.667,	1.00E+03,	1.01E+03,	2.16E+03,	48
2.750,	9.76E+02,	1.02E+03,	2.13E+03,	48
2.833,	9.51E+02,	1.04E+03,	2.09E+03,	49
2.917,	9.27E+02,	1.05E+03,	2.06E+03,	49
3.000,	9.05E+02,	1.06E+03,	2.03E+03,	50
3.083,	8.84E+02,	1.07E+03,	2.00E+03,	50
3.167,	8.64E+02,	1.09E+03,	1.97E+03,	51
3.250,	8.45E+02,	1.10E+03,	1.94E+03,	51
3.333,	8.28E+02,	1.11E+03,	1.92E+03,	52
3.417,	8.11E+02,	1.12E+03,	1.89E+03,	52
3.500,	7.95E+02,	1.13E+03,	1.86E+03,	53
3.583,	7.79E+02,	1.14E+03,	1.84E+03,	53
3.667,	7.65E+02,	1.16E+03,	1.82E+03,	54
3.750,	7.51E+02,	1.17E+03,	1.79E+03,	54

3.833,	7.37E+02,	1.18E+03,	1.77E+03,	55
3.917,	7.24E+02,	1.19E+03,	1.75E+03,	55
4.000,	7.12E+02,	1.20E+03,	1.73E+03,	56
4.083,	7.00E+02,	1.21E+03,	1.71E+03,	56
4.167,	6.88E+02,	1.22E+03,	1.69E+03,	57
4.250,	6.77E+02,	1.23E+03,	1.67E+03,	57
4.333,	6.67E+02,	1.24E+03,	1.65E+03,	58
4.417,	6.57E+02,	1.24E+03,	1.63E+03,	58
4.500,	6.47E+02,	1.25E+03,	1.61E+03,	59
4.583,	6.37E+02,	1.26E+03,	1.59E+03,	59
4.667,	6.28E+02,	1.27E+03,	1.58E+03,	60
4.750,	6.19E+02,	1.28E+03,	1.56E+03,	60
4.833,	6.10E+02,	1.29E+03,	1.55E+03,	61
4.917,	6.02E+02,	1.30E+03,	1.53E+03,	61
5.000,	5.93E+02,	1.31E+03,	1.51E+03,	62
5.083,	5.85E+02,	1.31E+03,	1.50E+03,	62
5.167,	5.78E+02,	1.32E+03,	1.48E+03,	63
5.250,	5.70E+02,	1.33E+03,	1.47E+03,	63
5.333,	5.63E+02,	1.34E+03,	1.46E+03,	64
5.417,	5.56E+02,	1.35E+03,	1.44E+03,	64
5.500,	5.49E+02,	1.35E+03,	1.43E+03,	65
5.583,	5.42E+02,	1.36E+03,	1.42E+03,	65
5.667,	5.35E+02,	1.37E+03,	1.40E+03,	66
5.750,	5.29E+02,	1.38E+03,	1.39E+03,	66
5.833,	5.23E+02,	1.38E+03,	1.38E+03,	67
5.917,	5.17E+02,	1.39E+03,	1.37E+03,	67
6.000,	5.11E+02,	1.40E+03,	1.36E+03,	68
6.083,	5.05E+02,	1.41E+03,	1.34E+03,	68
6.167,	4.99E+02,	1.41E+03,	1.33E+03,	69
6.250,	4.93E+02,	1.42E+03,	1.32E+03,	69
6.333,	4.88E+02,	1.43E+03,	1.31E+03,	70
6.417,	4.83E+02,	1.43E+03,	1.30E+03,	70
6.500,	4.78E+02,	1.44E+03,	1.29E+03,	71
6.583,	4.72E+02,	1.45E+03,	1.28E+03,	71
6.667,	4.67E+02,	1.45E+03,	1.27E+03,	72
6.750,	4.63E+02,	1.46E+03,	1.26E+03,	72
6.833,	4.58E+02,	1.47E+03,	1.25E+03,	73
6.917,	4.53E+02,	1.47E+03,	1.24E+03,	73
7.000,	4.48E+02,	1.48E+03,	1.23E+03,	74
7.083,	4.44E+02,	1.49E+03,	1.22E+03,	74
7.167,	4.40E+02,	1.49E+03,	1.21E+03,	75
7.250,	4.35E+02,	1.50E+03,	1.20E+03,	75
7.333,	4.31E+02,	1.50E+03,	1.20E+03,	76
7.417,	4.27E+02,	1.51E+03,	1.19E+03,	76
7.500,	4.23E+02,	1.52E+03,	1.18E+03,	77

M-00-0002 RD
ATT 5.

RUN-TRC04 · CHLORINE TRANS ACCIDENT - 4 METER RELEASE

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:26:01

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	4.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                    (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                         =      Chlorine
Molecular Weight              (gm/mole)   =       70.9
Heat of Vapor.                   (j/gm)   =      288.0
Initial Boiling Point              (C)     =      -34.1
Heat Capacity                 (j/gm-C)    =        .946
Specific Gravity                          =       1.570
Diffusion Coef.           (cm**2/sec)     =        .079


MODEL PARAMETERS:
Puff Release Interval                 (sec) =   10
Time Step                             (sec) =    5
Delay Between Release and Intake      (sec) =  300
Threshold Concentration               (ppm) =    3.63E-04
To convert ppm to g/m**3, multiply by       =    2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                     (ppm) =    2.18E+03
Exposure Two Minutes After Arrival    (g-sec/m**3) =    7.71E+02
Time From Plume Arrival to Max. Conc.         (sec) =   60.
Max. Conc. in Two Minutes After Arrival       (ppm) =    5.06E+03
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC04EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC04EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC04EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC04EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC04EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:26:01"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

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1.8333, 13, .00, .00, 519.66, .00, 9.08, .34, 3.27, 33.68, .01, -34.10, 1035.00, 217.00, 444.89, 6070.59, 7767.48

2.0000, 14, .00, .00, 511.00, .00, 8.65, .33, 3.25, 33.10, .01, -34.10, 1035.00, 217.00, 444.89, 5832.44, 7529.32

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2.3333, 16, .00, .00, 494.81, .00, 7.92,

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.32,        3.19,       32.02,        .01,     -34.10,    1035.00,     217.00,
444.89,    5429.70,     7126.59
    2.5000,   17,          .00,         .00,     487.20,        .00,       7.61,
.32,        3.17,       31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,     6954.17
    2.6667,   18,          .00,         .00,     479.88,        .00,       7.32,
.31,        3.14,       31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,     6797.20
    2.8333,   19,          .00,         .00,     472.81,        .00,       7.06,
.31,        3.12,       30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,     6653.50
    3.0000,   20,          .00,         .00,     465.99,        .00,       6.82,
.30,        3.10,       30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,     6521.30
    3.1667,   21,          .00,         .00,     459.40,        .00,       6.59,
.30,        3.07,       29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,     6399.15
    3.3333,   22,          .00,         .00,     453.01,        .00,       6.39,
.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,     6285.82
    3.5000,   23,          .00,         .00,     446.82,        .00,       6.19,
.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
    3.6667,   24,          .00,         .00,     440.81,        .00,       6.01,
.28,        3.01,       28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,     6081.77
    3.8333,   25,          .00,         .00,     434.97,        .00,       5.84,
.28,        2.99,       28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,     5989.44
    4.0000,   26,          .00,         .00,     429.29,        .00,       5.68,
.28,        2.97,       27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,     5902.72
    4.1667,   27,          .00,         .00,     423.77,        .00,       5.53,
.27,        2.95,       27.34,        .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,     5821.04
    4.3333,   28,          .00,         .00,     418.38,        .00,       5.38,
.27,        2.93,       26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,     5743.95
    4.5000,   29,          .00,         .00,     413.14,        .00,       5.25,
.27,        2.91,       26.65,        .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,     5671.02
    4.6667,   30,          .00,         .00,     408.02,        .00,       5.12,
.26,        2.89,       26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,     5601.90
    4.8333,   31,          .00,         .00,     403.02,        .00,       5.00,
.26,        2.88,       25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,     5536.27
    5.0000,   32,          .00,         .00,     398.14,        .00,       4.88,
.26,        2.86,       25.67,        .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,     5473.83
    5.1667,   33,          .00,         .00,     393.38,        .00,       4.77,
.25,        2.84,       25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,     5414.35
    5.3333,   34,          .00,         .00,     388.71,        .00,       4.66,
.25,        2.82,       25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,     5357.59
    5.5000,   35,          .00,         .00,     384.16,        .00,       4.56,
.25,        2.81,       24.76,        .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,     5303.36
    5.6667,   36,          .00,         .00,     379.69,        .00,       4.46,
.24,        2.79,       24.47,        .01,     -34.10,    1035.00,     217.00,
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444.89,    3554.57,    5251.46
    5.8333,  37,          .00,        .00,     375.33,         .00,      4.37,
.24,         2.77,       24.18,        .01,    -34.10,    1035.00,     217.00,
444.89,    3504.86,    5201.74
    6.0000,  38,          .00,        .00,     371.05,         .00,      4.28,
.24,         2.76,       23.91,        .01,    -34.10,    1035.00,     217.00,
444.89,    3457.17,    5154.06
    6.1667,  39,          .00,        .00,     366.86,         .00,      4.19,
.24,         2.74,       23.63,        .01,    -34.10,    1035.00,     217.00,
444.89,    3411.38,    5108.26
    6.3333,  40,          .00,        .00,     362.75,         .00,      4.11,
.23,         2.73,       23.37,        .01,    -34.10,    1035.00,     217.00,
444.89,    3367.36,    5064.25
    6.5000,  41,          .00,        .00,     358.72,         .00,      4.03,
.23,         2.71,       23.10,        .01,    -34.10,    1035.00,     217.00,
444.89,    3325.00,    5021.89
    6.6667,  42,          .00,        .00,     354.77,         .00,      3.95,
.23,         2.70,       22.85,        .01,    -34.10,    1035.00,     217.00,
444.89,    3284.20,    4981.09
    6.8333,  43,          .00,        .00,     350.89,         .00,      3.88,
.23,         2.68,       22.60,        .01,    -34.10,    1035.00,     217.00,
444.89,    3244.87,    4941.75
    7.0000,  44,          .00,        .00,     347.08,         .00,      3.81,
.22,         2.67,       22.35,        .01,    -34.10,    1035.00,     217.00,
444.89,    3206.91,    4903.80
    7.1667,  45,          .00,        .00,     343.35,         .00,      3.74,
.22,         2.65,       22.11,        .01,    -34.10,    1035.00,     217.00,
444.89,    3170.26,    4867.15
    7.3333,  46,          .00,        .00,     339.68,         .00,      3.67,
.22,         2.64,       21.87,        .01,    -34.10,    1035.00,     217.00,
444.89,    3134.84,    4831.73
    7.5000,  47,          .00,        .00,     336.07,         .00,      3.60,
.22,         2.62,       21.64,        .01,    -34.10,    1035.00,     217.00,
444.89,    3100.58,    4797.47
    7.6667,  48,          .00,        .00,     332.53,         .00,      3.54,
.21,         2.61,       21.41,        .01,    -34.10,    1035.00,     217.00,
444.89,    3067.42,    4764.30
    7.8333,  49,          .00,        .00,     329.05,         .00,      3.48,
.21,         2.60,       21.18,        .01,    -34.10,    1035.00,     217.00,
444.89,    3035.30,    4732.18
    8.0000,  50,          .00,        .00,     325.63,         .00,      3.42,
.21,         2.58,       20.96,        .01,    -34.10,    1035.00,     217.00,
444.89,    3004.16,    4701.05
    8.1667,  51,          .00,        .00,     322.27,         .00,      3.36,
.21,         2.57,       20.74,        .01,    -34.10,    1035.00,     217.00,
444.89,    2973.97,    4670.86
    8.3333,  52,          .00,        .00,     318.96,         .00,      3.31,
.21,         2.56,       20.53,        .01,    -34.10,    1035.00,     217.00,
444.89,    2944.67,    4641.56
    8.5000,  53,          .00,        .00,     315.71,         .00,      3.25,
.20,         2.54,       20.32,        .01,    -34.10,    1035.00,     217.00,
444.89,    2916.22,    4613.10
    8.6667,  54,          .00,        .00,     312.50,         .00,      3.20,
.20,         2.53,       20.11,        .01,    -34.10,    1035.00,     217.00,
444.89,    2888.58,    4585.46
    8.8333,  55,          .00,        .00,     309.35,         .00,      3.15,
.20,         2.52,       19.90,        .01,    -34.10,    1035.00,     217.00,
444.89,    2861.70,    4558.59
    9.0000,  56,          .00,        .00,     306.25,         .00,      3.10,
.20,         2.50,       19.70,        .01,    -34.10,    1035.00,     217.00,
444.89,    2835.57,    4532.46
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    9.1667,  57,       .00,       .00,    303.20,       .00,      3.05,
.20,       2.49,     19.51,       .01,    -34.10,   1035.00,    217.00,
444.89,    2810.14,   4507.02
    9.3333,  58,       .00,       .00,    300.19,       .00,      3.01,
.19,       2.48,     19.31,       .01,    -34.10,   1035.00,    217.00,
444.89,    2785.38,   4482.27
    9.5000,  59,       .00,       .00,    297.23,       .00,      2.96,
.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
444.89,    2761.26,   4458.15
    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
    9.8333,  61,       .00,       .00,    291.45,       .00,      2.87,
.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
   10.6667,  66,       .00,       .00,    277.71,       .00,      2.67,
.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:26:01"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	1.68E+00,	2.37E-02,	1.68E+00,	32
.083,	7.19E+00,	1.25E-01,	4.44E+00,	32
.167,	2.48E+01,	4.77E-01,	1.12E+01,	33
.250,	7.37E+01,	1.52E+00,	2.69E+01,	33
.333,	1.89E+02,	4.19E+00,	5.92E+01,	34
.417,	4.22E+02,	1.02E+01,	1.20E+02,	34
.500,	8.29E+02,	2.19E+01,	2.21E+02,	35
.583,	1.45E+03,	4.23E+01,	3.74E+02,	35
.667,	2.25E+03,	7.42E+01,	5.83E+02,	36
.750,	3.17E+03,	1.19E+02,	8.42E+02,	36
.833,	4.04E+03,	1.76E+02,	1.13E+03,	37
.917,	4.70E+03,	2.43E+02,	1.43E+03,	37
1.000,	5.06E+03,	3.14E+02,	1.71E+03,	38
1.083,	5.05E+03,	3.86E+02,	1.95E+03,	38
1.167,	4.74E+03,	4.53E+02,	2.13E+03,	39
1.250,	4.22E+03,	5.12E+02,	2.26E+03,	39
1.333,	3.61E+03,	5.63E+02,	2.34E+03,	40
1.417,	3.02E+03,	6.06E+02,	2.38E+03,	40
1.500,	2.50E+03,	6.41E+02,	2.39E+03,	41
1.583,	2.08E+03,	6.71E+02,	2.37E+03,	41
1.667,	1.76E+03,	6.96E+02,	2.34E+03,	42
1.750,	1.54E+03,	7.17E+02,	2.31E+03,	42
1.833,	1.38E+03,	7.37E+02,	2.27E+03,	43
1.917,	1.26E+03,	7.55E+02,	2.22E+03,	43
2.000,	1.18E+03,	7.71E+02,	2.18E+03,	44
2.083,	1.12E+03,	7.87E+02,	2.14E+03,	44
2.167,	1.06E+03,	8.02E+02,	2.10E+03,	45
2.250,	1.02E+03,	8.17E+02,	2.06E+03,	45
2.333,	9.85E+02,	8.30E+02,	2.03E+03,	46
2.417,	9.52E+02,	8.44E+02,	1.99E+03,	46
2.500,	9.22E+02,	8.57E+02,	1.96E+03,	47
2.583,	8.95E+02,	8.70E+02,	1.92E+03,	47
2.667,	8.69E+02,	8.82E+02,	1.89E+03,	48
2.750,	8.46E+02,	8.94E+02,	1.86E+03,	48
2.833,	8.24E+02,	9.05E+02,	1.83E+03,	49
2.917,	8.03E+02,	9.17E+02,	1.80E+03,	49
3.000,	7.84E+02,	9.28E+02,	1.77E+03,	50
3.083,	7.66E+02,	9.39E+02,	1.75E+03,	50
3.167,	7.49E+02,	9.49E+02,	1.72E+03,	51
3.250,	7.33E+02,	9.60E+02,	1.70E+03,	51
3.333,	7.17E+02,	9.70E+02,	1.67E+03,	52
3.417,	7.03E+02,	9.80E+02,	1.65E+03,	52
3.500,	6.89E+02,	9.90E+02,	1.63E+03,	53
3.583,	6.75E+02,	9.99E+02,	1.61E+03,	53
3.667,	6.63E+02,	1.01E+03,	1.58E+03,	54
3.750,	6.50E+02,	1.02E+03,	1.56E+03,	54

3.833,	6.39E+02,	1.03E+03,	1.54E+03,	55
3.917,	6.28E+02,	1.04E+03,	1.53E+03,	55
4.000,	6.17E+02,	1.04E+03,	1.51E+03,	56
4.083,	6.06E+02,	1.05E+03,	1.49E+03,	56
4.167,	5.97E+02,	1.06E+03,	1.47E+03,	57
4.250,	5.87E+02,	1.07E+03,	1.45E+03,	57
4.333,	5.78E+02,	1.08E+03,	1.44E+03,	58
4.417,	5.69E+02,	1.09E+03,	1.42E+03,	58
4.500,	5.60E+02,	1.09E+03,	1.41E+03,	59
4.583,	5.52E+02,	1.10E+03,	1.39E+03,	59
4.667,	5.44E+02,	1.11E+03,	1.38E+03,	60
4.750,	5.36E+02,	1.12E+03,	1.36E+03,	60
4.833,	5.28E+02,	1.12E+03,	1.35E+03,	61
4.917,	5.21E+02,	1.13E+03,	1.33E+03,	61
5.000,	5.14E+02,	1.14E+03,	1.32E+03,	62
5.083,	5.07E+02,	1.15E+03,	1.31E+03,	62
5.167,	5.00E+02,	1.15E+03,	1.29E+03,	63
5.250,	4.94E+02,	1.16E+03,	1.28E+03,	63
5.333,	4.88E+02,	1.17E+03,	1.27E+03,	64
5.417,	4.81E+02,	1.17E+03,	1.26E+03,	64
5.500,	4.75E+02,	1.18E+03,	1.25E+03,	65
5.583,	4.69E+02,	1.19E+03,	1.23E+03,	65
5.667,	4.64E+02,	1.19E+03,	1.22E+03,	66
5.750,	4.58E+02,	1.20E+03,	1.21E+03,	66
5.833,	4.53E+02,	1.21E+03,	1.20E+03,	67
5.917,	4.47E+02,	1.21E+03,	1.19E+03,	67
6.000,	4.42E+02,	1.22E+03,	1.18E+03,	68
6.083,	4.37E+02,	1.23E+03,	1.17E+03,	68
6.167,	4.32E+02,	1.23E+03,	1.16E+03,	69
6.250,	4.28E+02,	1.24E+03,	1.15E+03,	69
6.333,	4.23E+02,	1.24E+03,	1.14E+03,	70
6.417,	4.18E+02,	1.25E+03,	1.13E+03,	70
6.500,	4.14E+02,	1.26E+03,	1.12E+03,	71
6.583,	4.09E+02,	1.26E+03,	1.11E+03,	71
6.667,	4.05E+02,	1.27E+03,	1.11E+03,	72
6.750,	4.01E+02,	1.27E+03,	1.10E+03,	72
6.833,	3.97E+02,	1.28E+03,	1.09E+03,	73
6.917,	3.93E+02,	1.28E+03,	1.08E+03,	73
7.000,	3.89E+02,	1.29E+03,	1.07E+03,	74
7.083,	3.85E+02,	1.29E+03,	1.06E+03,	74
7.167,	3.81E+02,	1.30E+03,	1.06E+03,	75
7.250,	3.77E+02,	1.31E+03,	1.05E+03,	75
7.333,	3.73E+02,	1.31E+03,	1.04E+03,	76
7.417,	3.70E+02,	1.32E+03,	1.03E+03,	76
7.500,	3.66E+02,	1.32E+03,	1.03E+03,	77

RUN TRCL06 - CHLORINE TRANS. ACCIDENT - 6 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:26:33

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	6.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	3.57E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	1.75E+03
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	6.17E+02
Time From Plume Arrival to Max. Conc.	(sec)	=	65.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	4.07E+03

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC06EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC06EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC06EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC06EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC06EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:26:33"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

.1667, 3, .00, .00, 648.58, .00, 24.67, .43, 3.69, 42.88, .01, -34.10, 1035.00, 217.00, 444.89, 14869.85, 16566.74

.3333, 4, .00, .00, 628.73, .00, 19.85, .41, 3.63, 41.31, .01, -34.10, 1035.00, 217.00, 444.89, 12141.18, 13838.07

.5000, 5, .00, .00, 611.75, .00, 16.98, .40, 3.57, 40.05, .01, -34.10, 1035.00, 217.00, 444.89, 10514.57, 12211.46

.6667, 6, .00, .00, 596.73, .00, 15.02, .39, 3.52, 38.97, .01, -34.10, 1035.00, 217.00, 444.89, 9404.52, 11101.41

.8333, 7, .00, .00, 583.16, .00, 13.57, .38, 3.48, 38.01, .01, -34.10, 1035.00, 217.00, 444.89, 8585.11, 10282.00

1.0000, 8, .00, .00, 570.73, .00, 12.44, .37, 3.44, 37.14, .01, -34.10, 1035.00, 217.00, 444.89, 7948.27, 9645.16

1.1667, 9, .00, .00, 559.20, .00, 11.53, .36, 3.40, 36.35, .01, -34.10, 1035.00, 217.00, 444.89, 7434.93, 9131.81

1.3333, 10, .00, .00, 548.43, .00, 10.77, .36, 3.37, 35.62, .01, -34.10, 1035.00, 217.00, 444.89, 7009.72, 8706.60

1.5000, 11, .00, .00, 538.31, .00, 10.12, .35, 3.33, 34.93, .01, -34.10, 1035.00, 217.00, 444.89, 6650.00, 8346.89

1.6667, 12, .00, .00, 528.74, .00, 9.57, .34, 3.30, 34.29, .01, -34.10, 1035.00, 217.00, 444.89, 6340.53, 8037.41

1.8333, 13, .00, .00, 519.66, .00, 9.08, .34, 3.27, 33.68, .01, -34.10, 1035.00, 217.00, 444.89, 6070.59, 7767.48

2.0000, 14, .00, .00, 511.00, .00, 8.65, .33, 3.25, 33.10, .01, -34.10, 1035.00, 217.00, 444.89, 5832.44, 7529.32

2.1667, 15, .00, .00, 502.73, .00, 8.27, .33, 3.22, 32.55, .01, -34.10, 1035.00, 217.00, 444.89, 5620.28, 7317.16

2.3333, 16, .00, .00, 494.81, .00, 7.92,

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.32,        3.19,       32.02,        .01,     -34.10,    1035.00,     217.00,
444.89,    5429.70,     7126.59
    2.5000,  17,          .00,         .00,     487.20,        .00,       7.61,
.32,        3.17,       31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,     6954.17
    2.6667,  18,          .00,         .00,     479.88,        .00,       7.32,
.31,        3.14,       31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,     6797.20
    2.8333,  19,          .00,         .00,     472.81,        .00,       7.06,
.31,        3.12,       30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,     6653.50
    3.0000,  20,          .00,         .00,     465.99,        .00,       6.82,
.30,        3.10,       30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,     6521.30
    3.1667,  21,          .00,         .00,     459.40,        .00,       6.59,
.30,        3.07,       29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,     6399.15
    3.3333,  22,          .00,         .00,     453.01,        .00,       6.39,
.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,     6285.82
    3.5000,  23,          .00,         .00,     446.82,        .00,       6.19,
.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
    3.6667,  24,          .00,         .00,     440.81,        .00,       6.01,
.28,        3.01,       28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,     6081.77
    3.8333,  25,          .00,         .00,     434.97,        .00,       5.84,
.28,        2.99,       28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,     5989.44
    4.0000,  26,          .00,         .00,     429.29,        .00,       5.68,
.28,        2.97,       27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,     5902.72
    4.1667,  27,          .00,         .00,     423.77,        .00,       5.53,
.27,        2.95,       27.34,        .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,     5821.04
    4.3333,  28,          .00,         .00,     418.38,        .00,       5.38,
.27,        2.93,       26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,     5743.95
    4.5000,  29,          .00,         .00,     413.14,        .00,       5.25,
.27,        2.91,       26.65,        .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,     5671.02
    4.6667,  30,          .00,         .00,     408.02,        .00,       5.12,
.26,        2.89,       26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,     5601.90
    4.8333,  31,          .00,         .00,     403.02,        .00,       5.00,
.26,        2.88,       25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,     5536.27
    5.0000,  32,          .00,         .00,     398.14,        .00,       4.88,
.26,        2.86,       25.67,        .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,     5473.83
    5.1667,  33,          .00,         .00,     393.38,        .00,       4.77,
.25,        2.84,       25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,     5414.35
    5.3333,  34,          .00,         .00,     388.71,        .00,       4.66,
.25,        2.82,       25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,     5357.59
    5.5000,  35,          .00,         .00,     384.16,        .00,       4.56,
.25,        2.81,       24.76,        .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,     5303.36
    5.6667,  36,          .00,         .00,     379.69,        .00,       4.46,
.24,        2.79,       24.47,        .01,     -34.10,    1035.00,     217.00,
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444.89,    3554.57,    5251.46
    5.8333,  37,          .00,        .00,     375.33,         .00,      4.37,
.24,         2.77,       24.18,         .01,    -34.10,    1035.00,     217.00,
444.89,    3504.86,    5201.74
    6.0000,  38,          .00,        .00,     371.05,         .00,      4.28,
.24,         2.76,       23.91,         .01,    -34.10,    1035.00,     217.00,
444.89,    3457.17,    5154.06
    6.1667,  39,          .00,        .00,     366.86,         .00,      4.19,
.24,         2.74,       23.63,         .01,    -34.10,    1035.00,     217.00,
444.89,    3411.38,    5108.26
    6.3333,  40,          .00,        .00,     362.75,         .00,      4.11,
.23,         2.73,       23.37,         .01,    -34.10,    1035.00,     217.00,
444.89,    3367.36,    5064.25
    6.5000,  41,          .00,        .00,     358.72,         .00,      4.03,
.23,         2.71,       23.10,         .01,    -34.10,    1035.00,     217.00,
444.89,    3325.00,    5021.89
    6.6667,  42,          .00,        .00,     354.77,         .00,      3.95,
.23,         2.70,       22.85,         .01,    -34.10,    1035.00,     217.00,
444.89,    3284.20,    4981.09
    6.8333,  43,          .00,        .00,     350.89,         .00,      3.88,
.23,         2.68,       22.60,         .01,    -34.10,    1035.00,     217.00,
444.89,    3244.87,    4941.75
    7.0000,  44,          .00,        .00,     347.08,         .00,      3.81,
.22,         2.67,       22.35,         .01,    -34.10,    1035.00,     217.00,
444.89,    3206.91,    4903.80
    7.1667,  45,          .00,        .00,     343.35,         .00,      3.74,
.22,         2.65,       22.11,         .01,    -34.10,    1035.00,     217.00,
444.89,    3170.26,    4867.15
    7.3333,  46,          .00,        .00,     339.68,         .00,      3.67,
.22,         2.64,       21.87,         .01,    -34.10,    1035.00,     217.00,
444.89,    3134.84,    4831.73
    7.5000,  47,          .00,        .00,     336.07,         .00,      3.60,
.22,         2.62,       21.64,         .01,    -34.10,    1035.00,     217.00,
444.89,    3100.58,    4797.47
    7.6667,  48,          .00,        .00,     332.53,         .00,      3.54,
.21,         2.61,       21.41,         .01,    -34.10,    1035.00,     217.00,
444.89,    3067.42,    4764.30
    7.8333,  49,          .00,        .00,     329.05,         .00,      3.48,
.21,         2.60,       21.18,         .01,    -34.10,    1035.00,     217.00,
444.89,    3035.30,    4732.18
    8.0000,  50,          .00,        .00,     325.63,         .00,      3.42,
.21,         2.58,       20.96,         .01,    -34.10,    1035.00,     217.00,
444.89,    3004.16,    4701.05
    8.1667,  51,          .00,        .00,     322.27,         .00,      3.36,
.21,         2.57,       20.74,         .01,    -34.10,    1035.00,     217.00,
444.89,    2973.97,    4670.86
    8.3333,  52,          .00,        .00,     318.96,         .00,      3.31,
.21,         2.56,       20.53,         .01,    -34.10,    1035.00,     217.00,
444.89,    2944.67,    4641.56
    8.5000,  53,          .00,        .00,     315.71,         .00,      3.25,
.20,         2.54,       20.32,         .01,    -34.10,    1035.00,     217.00,
444.89,    2916.22,    4613.10
    8.6667,  54,          .00,        .00,     312.50,         .00,      3.20,
.20,         2.53,       20.11,         .01,    -34.10,    1035.00,     217.00,
444.89,    2888.58,    4585.46
    8.8333,  55,          .00,        .00,     309.35,         .00,      3.15,
.20,         2.52,       19.90,         .01,    -34.10,    1035.00,     217.00,
444.89,    2861.70,    4558.59
    9.0000,  56,          .00,        .00,     306.25,         .00,      3.10,
.20,         2.50,       19.70,         .01,    -34.10,    1035.00,     217.00,
444.89,    2835.57,    4532.46
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    9.1667,  57,       .00,       .00,    303.20,       .00,      3.05,
.20,       2.49,     19.51,       .01,    -34.10,   1035.00,    217.00,
444.89,    2810.14,   4507.02
    9.3333,  58,       .00,       .00,    300.19,       .00,      3.01,
.19,       2.48,     19.31,       .01,    -34.10,   1035.00,    217.00,
444.89,    2785.38,   4482.27
    9.5000,  59,       .00,       .00,    297.23,       .00,      2.96,
.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
444.89,    2761.26,   4458.15
    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
    9.8333,  61,       .00,       .00,    291.45,       .00,      2.87,
.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
   10.6667,  66,       .00,       .00,    277.71,       .00,      2.67,
.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:26:33"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	1.28E+00,	1.81E-02,	1.28E+00,	32
.083,	5.52E+00,	9.62E-02,	3.40E+00,	32
.167,	1.92E+01,	3.67E-01,	8.65E+00,	33
.250,	5.71E+01,	1.17E+00,	2.08E+01,	33
.333,	1.47E+02,	3.25E+00,	4.60E+01,	34
.417,	3.30E+02,	7.92E+00,	9.33E+01,	34
.500,	6.51E+02,	1.71E+01,	1.73E+02,	35
.583,	1.14E+03,	3.33E+01,	2.94E+02,	35
.667,	1.79E+03,	5.85E+01,	4.60E+02,	36
.750,	2.52E+03,	9.41E+01,	6.66E+02,	36
.833,	3.22E+03,	1.40E+02,	8.98E+02,	37
.917,	3.77E+03,	1.93E+02,	1.14E+03,	37
1.000,	4.06E+03,	2.50E+02,	1.36E+03,	38
1.083,	4.07E+03, MAX	3.08E+02,	1.55E+03,	38
1.167,	3.82E+03,	3.62E+02,	1.71E+03,	39
1.250,	3.41E+03,	4.10E+02,	1.81E+03,	39
1.333,	2.91E+03,	4.51E+02,	1.88E+03,	40
1.417,	2.43E+03,	4.85E+02,	1.91E+03,	40
1.500,	2.01E+03,	5.14E+02,	1.91E+03,	41
1.583,	1.67E+03,	5.37E+02,	1.90E+03,	41
1.667,	1.41E+03,	5.57E+02,	1.88E+03,	42
1.750,	1.22E+03,	5.75E+02,	1.85E+03,	42
1.833,	1.09E+03,	5.90E+02,	1.81E+03,	43
1.917,	9.99E+02,	6.04E+02,	1.78E+03,	43
2.000,	9.32E+02,	6.17E+02,	1.75E+03,	44
2.083,	8.81E+02,	6.30E+02,	1.71E+03,	44
2.167,	8.40E+02,	6.42E+02,	1.68E+03,	45
2.250,	8.06E+02,	6.53E+02,	1.65E+03,	45
2.333,	7.77E+02,	6.64E+02,	1.62E+03,	46
2.417,	7.50E+02,	6.75E+02,	1.59E+03,	46
2.500,	7.27E+02,	6.85E+02,	1.56E+03,	47
2.583,	7.05E+02,	6.95E+02,	1.54E+03,	47
2.667,	6.85E+02,	7.05E+02,	1.51E+03,	48
2.750,	6.67E+02,	7.14E+02,	1.49E+03,	48
2.833,	6.49E+02,	7.23E+02,	1.46E+03,	49
2.917,	6.33E+02,	7.32E+02,	1.44E+03,	49
3.000,	6.18E+02,	7.41E+02,	1.42E+03,	50
3.083,	6.04E+02,	7.49E+02,	1.39E+03,	50
3.167,	5.90E+02,	7.58E+02,	1.37E+03,	51
3.250,	5.77E+02,	7.66E+02,	1.35E+03,	51
3.333,	5.65E+02,	7.74E+02,	1.33E+03,	52
3.417,	5.53E+02,	7.82E+02,	1.32E+03,	52
3.500,	5.42E+02,	7.89E+02,	1.30E+03,	53
3.583,	5.32E+02,	7.97E+02,	1.28E+03,	53
3.667,	5.22E+02,	8.04E+02,	1.26E+03,	54
3.750,	5.12E+02,	8.11E+02,	1.25E+03,	54

3.833,	5.03E+02,	8.19E+02,	1.23E+03,	55
3.917,	4.94E+02,	8.26E+02,	1.22E+03,	55
4.000,	4.86E+02,	8.32E+02,	1.20E+03,	56
4.083,	4.78E+02,	8.39E+02,	1.19E+03,	56
4.167,	4.70E+02,	8.46E+02,	1.17E+03,	57
4.250,	4.62E+02,	8.52E+02,	1.16E+03,	57
4.333,	4.55E+02,	8.59E+02,	1.15E+03,	58
4.417,	4.48E+02,	8.65E+02,	1.13E+03,	58
4.500,	4.41E+02,	8.71E+02,	1.12E+03,	59
4.583,	4.35E+02,	8.78E+02,	1.11E+03,	59
4.667,	4.28E+02,	8.84E+02,	1.10E+03,	60
4.750,	4.22E+02,	8.90E+02,	1.08E+03,	60
4.833,	4.16E+02,	8.95E+02,	1.07E+03,	61
4.917,	4.10E+02,	9.01E+02,	1.06E+03,	61
5.000,	4.05E+02,	9.07E+02,	1.05E+03,	62
5.083,	3.99E+02,	9.13E+02,	1.04E+03,	62
5.167,	3.94E+02,	9.18E+02,	1.03E+03,	63
5.250,	3.89E+02,	9.24E+02,	1.02E+03,	63
5.333,	3.84E+02,	9.29E+02,	1.01E+03,	64
5.417,	3.79E+02,	9.34E+02,	1.00E+03,	64
5.500,	3.74E+02,	9.40E+02,	9.92E+02,	65
5.583,	3.70E+02,	9.45E+02,	9.83E+02,	65
5.667,	3.65E+02,	9.50E+02,	9.74E+02,	66
5.750,	3.61E+02,	9.55E+02,	9.65E+02,	66
5.833,	3.57E+02,	9.60E+02,	9.57E+02,	67
5.917,	3.52E+02,	9.65E+02,	9.48E+02,	67
6.000,	3.48E+02,	9.70E+02,	9.40E+02,	68
6.083,	3.44E+02,	9.75E+02,	9.32E+02,	68
6.167,	3.40E+02,	9.80E+02,	9.24E+02,	69
6.250,	3.37E+02,	9.85E+02,	9.16E+02,	69
6.333,	3.33E+02,	9.89E+02,	9.09E+02,	70
6.417,	3.29E+02,	9.94E+02,	9.01E+02,	70
6.500,	3.26E+02,	9.99E+02,	8.94E+02,	71
6.583,	3.22E+02,	1.00E+03,	8.87E+02,	71
6.667,	3.19E+02,	1.01E+03,	8.80E+02,	72
6.750,	3.16E+02,	1.01E+03,	8.73E+02,	72
6.833,	3.12E+02,	1.02E+03,	8.66E+02,	73
6.917,	3.09E+02,	1.02E+03,	8.60E+02,	73
7.000,	3.06E+02,	1.03E+03,	8.53E+02,	74
7.083,	3.03E+02,	1.03E+03,	8.47E+02,	74
7.167,	3.00E+02,	1.03E+03,	8.40E+02,	75
7.250,	2.97E+02,	1.04E+03,	8.34E+02,	75
7.333,	2.94E+02,	1.04E+03,	8.28E+02,	76
7.417,	2.91E+02,	1.05E+03,	8.22E+02,	76
7.500,	2.88E+02,	1.05E+03,	8.16E+02,	77

RUN TRC08 - CHLORINE TRANS. ACCIDENT - 8 METER RELEASE

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:27:04

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	8.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                     =      Chlorine
Molecular Weight           (gm/mole) =       70.9
Heat of Vapor.                (j/gm) =      288.0
Initial Boiling Point           (C) =      -34.1
Heat Capacity              (j/gm-C) =        .946
Specific Gravity                      =      1.570
Diffusion Coef.         (cm**2/sec) =        .079


MODEL PARAMETERS:
Puff Release Interval                (sec) =   10
Time Step                            (sec) =    5
Delay Between Release and Intake     (sec) =  300
Threshold Concentration              (ppm) =    3.49E-04
To convert ppm to g/m**3, multiply by      =    2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                    (ppm) =    1.28E+03
Exposure Two Minutes After Arrival  (g-sec/m**3) =    4.52E+02
Time From Plume Arrival to Max. Conc.       (sec) =   65.
Max. Conc. in Two Minutes After Arrival     (ppm) =    3.00E+03
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:27:04"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

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444.89,    5429.70,    7126.59
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.32,       3.17,      31.52,       .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,    6954.17
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.31,       3.14,      31.03,       .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,    6797.20
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444.89,    4956.62,    6653.50
    3.0000,  20,         .00,       .00,     465.99,        .00,       6.82,
.30,       3.10,      30.12,       .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,    6521.30
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.30,       3.07,      29.68,       .01,     -34.10,    1035.00,     217.00,
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.29,       3.05,      29.26,       .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,    6285.82
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.29,       3.03,      28.85,       .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,    6180.32
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.28,       3.01,      28.46,       .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,    6081.77
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444.89,    4292.56,    5989.44
    4.0000,  26,         .00,       .00,     429.29,        .00,       5.68,
.28,       2.97,      27.71,       .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,    5902.72
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444.89,    4124.15,    5821.04
    4.3333,  28,         .00,       .00,     418.38,        .00,       5.38,
.27,       2.93,      26.99,       .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,    5743.95
    4.5000,  29,         .00,       .00,     413.14,        .00,       5.25,
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444.89,    3974.14,    5671.02
    4.6667,  30,         .00,       .00,     408.02,        .00,       5.12,
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444.89,    3905.01,    5601.90
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444.89,    3839.38,    5536.27
    5.0000,  32,         .00,       .00,     398.14,        .00,       4.88,
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444.89,    3717.46,    5414.35
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444.89,    3660.70,    5357.59
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444.89,    3606.47,    5303.36
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    6.1667,  39,          .00,        .00,     366.86,         .00,       4.19,
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444.89,    2973.97,    4670.86
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.21,         2.56,       20.53,        .01,    -34.10,     1035.00,     217.00,
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.20,         2.54,       20.32,        .01,    -34.10,     1035.00,     217.00,
444.89,    2916.22,    4613.10
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.20,         2.53,       20.11,        .01,    -34.10,     1035.00,     217.00,
444.89,    2888.58,    4585.46
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.20,         2.52,       19.90,        .01,    -34.10,     1035.00,     217.00,
444.89,    2861.70,    4558.59
    9.0000,  56,          .00,        .00,     306.25,         .00,       3.10,
.20,         2.50,       19.70,        .01,    -34.10,     1035.00,     217.00,
444.89,    2835.57,    4532.46
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444.89,    2810.14,   4507.02
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444.89,    2785.38,   4482.27
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.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
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444.89,    2692.51,   4389.39
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444.89,    2670.70,   4367.59
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444.89,    2649.42,   4346.31
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.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
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444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
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444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:27:04"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	8.81E-01,	1.25E-02,	8.81E-01,	32
.083,	3.81E+00,	6.63E-02,	2.34E+00,	32
.167,	1.33E+01,	2.54E-01,	6.00E+00,	33
.250,	4.00E+01,	8.20E-01,	1.45E+01,	33
.333,	1.04E+02,	2.28E+00,	3.23E+01,	34
.417,	2.34E+02,	5.59E+00,	6.59E+01,	34
.500,	4.65E+02,	1.22E+01,	1.23E+02,	35
.583,	8.19E+02,	2.37E+01,	2.10E+02,	35
.667,	1.29E+03,	4.20E+01,	3.30E+02,	36
.750,	1.83E+03,	6.78E+01,	4.79E+02,	36
.833,	2.35E+03,	1.01E+02,	6.49E+02,	37
.917,	2.76E+03,	1.40E+02,	8.25E+02,	37
1.000,	2.98E+03,	1.82E+02,	9.91E+02,	38
1.083,	3.00E+03,	Max 2.25E+02,	1.13E+03,	38
1.167,	2.83E+03,	2.65E+02,	1.25E+03,	39
1.250,	2.52E+03,	3.00E+02,	1.33E+03,	39
1.333,	2.16E+03,	3.31E+02,	1.38E+03,	40
1.417,	1.80E+03,	3.56E+02,	1.40E+03,	40
1.500,	1.48E+03,	3.77E+02,	1.40E+03,	41
1.583,	1.22E+03,	3.94E+02,	1.39E+03,	41
1.667,	1.03E+03,	4.09E+02,	1.38E+03,	42
1.750,	8.89E+02,	4.21E+02,	1.36E+03,	42
1.833,	7.90E+02,	4.33E+02,	1.33E+03,	43
1.917,	7.21E+02,	4.43E+02,	1.31E+03,	43
2.000,	6.71E+02,	4.52E+02,	1.28E+03,	44
2.083,	6.33E+02,	4.61E+02,	1.25E+03,	44
2.167,	6.03E+02,	4.70E+02,	1.23E+03,	45
2.250,	5.78E+02,	4.78E+02,	1.21E+03,	45
2.333,	5.57E+02,	4.86E+02,	1.18E+03,	46
2.417,	5.38E+02,	4.93E+02,	1.16E+03,	46
2.500,	5.21E+02,	5.01E+02,	1.14E+03,	47
2.583,	5.06E+02,	5.08E+02,	1.12E+03,	47
2.667,	4.91E+02,	5.15E+02,	1.10E+03,	48
2.750,	4.78E+02,	5.22E+02,	1.09E+03,	48
2.833,	4.65E+02,	5.28E+02,	1.07E+03,	49
2.917,	4.54E+02,	5.35E+02,	1.05E+03,	49
3.000,	4.43E+02,	5.41E+02,	1.03E+03,	50
3.083,	4.33E+02,	5.47E+02,	1.02E+03,	50
3.167,	4.23E+02,	5.53E+02,	1.00E+03,	51
3.250,	4.14E+02,	5.59E+02,	9.88E+02,	51
3.333,	4.05E+02,	5.65E+02,	9.74E+02,	52
3.417,	3.97E+02,	5.70E+02,	9.60E+02,	52
3.500,	3.89E+02,	5.76E+02,	9.47E+02,	53
3.583,	3.81E+02,	5.81E+02,	9.34E+02,	53
3.667,	3.74E+02,	5.86E+02,	9.22E+02,	54
3.750,	3.67E+02,	5.92E+02,	9.10E+02,	54

M00-0002 Rd
Att 7-Pg 8

3.833,	3.60E+02,	5.97E+02,	8.98E+02,	55
3.917,	3.54E+02,	6.02E+02,	8.87E+02,	55
4.000,	3.48E+02,	6.07E+02,	8.76E+02,	56
4.083,	3.42E+02,	6.11E+02,	8.65E+02,	56
4.167,	3.37E+02,	6.16E+02,	8.55E+02,	57
4.250,	3.31E+02,	6.21E+02,	8.44E+02,	57
4.333,	3.26E+02,	6.25E+02,	8.35E+02,	58
4.417,	3.21E+02,	6.30E+02,	8.25E+02,	58
4.500,	3.16E+02,	6.35E+02,	8.16E+02,	59
4.583,	3.11E+02,	6.39E+02,	8.07E+02,	59
4.667,	3.07E+02,	6.43E+02,	7.98E+02,	60
4.750,	3.02E+02,	6.48E+02,	7.90E+02,	60
4.833,	2.98E+02,	6.52E+02,	7.81E+02,	61
4.917,	2.94E+02,	6.56E+02,	7.73E+02,	61
5.000,	2.90E+02,	6.60E+02,	7.65E+02,	62
5.083,	2.86E+02,	6.64E+02,	7.57E+02,	62
5.167,	2.82E+02,	6.68E+02,	7.50E+02,	63
5.250,	2.79E+02,	6.72E+02,	7.43E+02,	63
5.333,	2.75E+02,	6.76E+02,	7.35E+02,	64
5.417,	2.71E+02,	6.80E+02,	7.28E+02,	64
5.500,	2.68E+02,	6.83E+02,	7.21E+02,	65
5.583,	2.65E+02,	6.87E+02,	7.15E+02,	65
5.667,	2.62E+02,	6.91E+02,	7.08E+02,	66
5.750,	2.58E+02,	6.95E+02,	7.02E+02,	66
5.833,	2.55E+02,	6.98E+02,	6.95E+02,	67
5.917,	2.52E+02,	7.02E+02,	6.89E+02,	67
6.000,	2.49E+02,	7.05E+02,	6.83E+02,	68
6.083,	2.47E+02,	7.09E+02,	6.77E+02,	68
6.167,	2.44E+02,	7.12E+02,	6.72E+02,	69
6.250,	2.41E+02,	7.16E+02,	6.66E+02,	69
6.333,	2.38E+02,	7.19E+02,	6.60E+02,	70
6.417,	2.36E+02,	7.22E+02,	6.55E+02,	70
6.500,	2.33E+02,	7.26E+02,	6.50E+02,	71
6.583,	2.31E+02,	7.29E+02,	6.44E+02,	71
6.667,	2.28E+02,	7.32E+02,	6.39E+02,	72
6.750,	2.26E+02,	7.35E+02,	6.34E+02,	72
6.833,	2.24E+02,	7.38E+02,	6.29E+02,	73
6.917,	2.21E+02,	7.42E+02,	6.24E+02,	73
7.000,	2.19E+02,	7.45E+02,	6.20E+02,	74
7.083,	2.17E+02,	7.48E+02,	6.15E+02,	74
7.167,	2.15E+02,	7.51E+02,	6.10E+02,	75
7.250,	2.13E+02,	7.54E+02,	6.06E+02,	75
7.333,	2.10E+02,	7.57E+02,	6.01E+02,	76
7.417,	2.08E+02,	7.60E+02,	5.97E+02,	76
7.500,	2.06E+02,	7.63E+02,	5.93E+02,	77

RUN NRC10 - CHLORINE TRANS ACCIDENT - 10 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:27:36

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	10.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	3.39E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	8.59E+02
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	3.04E+02
Time From Plume Arrival to Max. Conc.	(sec)	=	65.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	2.03E+03

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC10EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC10EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC10EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC10EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC10EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:27:36"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

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2.3333, 16, .00, .00, 494.81, .00, 7.92,

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444.89,    5429.70,     7126.59
    2.5000,  17,          .00,         .00,     487.20,        .00,        7.61,
.32,        3.17,       31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,     6954.17
    2.6667,  18,          .00,         .00,     479.88,        .00,        7.32,
.31,        3.14,       31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,     6797.20
    2.8333,  19,          .00,         .00,     472.81,        .00,        7.06,
.31,        3.12,       30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,     6653.50
    3.0000,  20,          .00,         .00,     465.99,        .00,        6.82,
.30,        3.10,       30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,     6521.30
    3.1667,  21,          .00,         .00,     459.40,        .00,        6.59,
.30,        3.07,       29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,     6399.15
    3.3333,  22,          .00,         .00,     453.01,        .00,        6.39,
.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,     6285.82
    3.5000,  23,          .00,         .00,     446.82,        .00,        6.19,
.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
    3.6667,  24,          .00,         .00,     440.81,        .00,        6.01,
.28,        3.01,       28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,     6081.77
    3.8333,  25,          .00,         .00,     434.97,        .00,        5.84,
.28,        2.99,       28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,     5989.44
    4.0000,  26,          .00,         .00,     429.29,        .00,        5.68,
.28,        2.97,       27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,     5902.72
    4.1667,  27,          .00,         .00,     423.77,        .00,        5.53,
.27,        2.95,       27.34,        .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,     5821.04
    4.3333,  28,          .00,         .00,     418.38,        .00,        5.38,
.27,        2.93,       26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,     5743.95
    4.5000,  29,          .00,         .00,     413.14,        .00,        5.25,
.27,        2.91,       26.65,        .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,     5671.02
    4.6667,  30,          .00,         .00,     408.02,        .00,        5.12,
.26,        2.89,       26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,     5601.90
    4.8333,  31,          .00,         .00,     403.02,        .00,        5.00,
.26,        2.88,       25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,     5536.27
    5.0000,  32,          .00,         .00,     398.14,        .00,        4.88,
.26,        2.86,       25.67,        .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,     5473.83
    5.1667,  33,          .00,         .00,     393.38,        .00,        4.77,
.25,        2.84,       25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,     5414.35
    5.3333,  34,          .00,         .00,     388.71,        .00,        4.66,
.25,        2.82,       25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,     5357.59
    5.5000,  35,          .00,         .00,     384.16,        .00,        4.56,
.25,        2.81,       24.76,        .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,     5303.36
    5.6667,  36,          .00,         .00,     379.69,        .00,        4.46,
.24,        2.79,       24.47,        .01,     -34.10,    1035.00,     217.00,
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.24, 2.74, 23.63, .01, -34.10, 1035.00, 217.00,
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.23, 2.73, 23.37, .01, -34.10, 1035.00, 217.00,
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.23, 2.71, 23.10, .01, -34.10, 1035.00, 217.00,
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.23, 2.70, 22.85, .01, -34.10, 1035.00, 217.00,
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444.89, 3244.87, 4941.75
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444.89, 3206.91, 4903.80
7.1667, 45, .00, .00, 343.35, .00, 3.74,
.22, 2.65, 22.11, .01, -34.10, 1035.00, 217.00,
444.89, 3170.26, 4867.15
7.3333, 46, .00, .00, 339.68, .00, 3.67,
.22, 2.64, 21.87, .01, -34.10, 1035.00, 217.00,
444.89, 3134.84, 4831.73
7.5000, 47, .00, .00, 336.07, .00, 3.60,
.22, 2.62, 21.64, .01, -34.10, 1035.00, 217.00,
444.89, 3100.58, 4797.47
7.6667, 48, .00, .00, 332.53, .00, 3.54,
.21, 2.61, 21.41, .01, -34.10, 1035.00, 217.00,
444.89, 3067.42, 4764.30
7.8333, 49, .00, .00, 329.05, .00, 3.48,
.21, 2.60, 21.18, .01, -34.10, 1035.00, 217.00,
444.89, 3035.30, 4732.18
8.0000, 50, .00, .00, 325.63, .00, 3.42,
.21, 2.58, 20.96, .01, -34.10, 1035.00, 217.00,
444.89, 3004.16, 4701.05
8.1667, 51, .00, .00, 322.27, .00, 3.36,
.21, 2.57, 20.74, .01, -34.10, 1035.00, 217.00,
444.89, 2973.97, 4670.86
8.3333, 52, .00, .00, 318.96, .00, 3.31,
.21, 2.56, 20.53, .01, -34.10, 1035.00, 217.00,
444.89, 2944.67, 4641.56
8.5000, 53, .00, .00, 315.71, .00, 3.25,
.20, 2.54, 20.32, .01, -34.10, 1035.00, 217.00,
444.89, 2916.22, 4613.10
8.6667, 54, .00, .00, 312.50, .00, 3.20,
.20, 2.53, 20.11, .01, -34.10, 1035.00, 217.00,
444.89, 2888.58, 4585.46
8.8333, 55, .00, .00, 309.35, .00, 3.15,
.20, 2.52, 19.90, .01, -34.10, 1035.00, 217.00,
444.89, 2861.70, 4558.59
9.0000, 56, .00, .00, 306.25, .00, 3.10,
.20, 2.50, 19.70, .01, -34.10, 1035.00, 217.00,
444.89, 2835.57, 4532.46

```
    9.1667,  57,       .00,       .00,    303.20,       .00,      3.05,
.20,       2.49,     19.51,       .01,    -34.10,   1035.00,    217.00,
444.89,    2810.14,   4507.02
    9.3333,  58,       .00,       .00,    300.19,       .00,      3.01,
.19,       2.48,     19.31,       .01,    -34.10,   1035.00,    217.00,
444.89,    2785.38,   4482.27
    9.5000,  59,       .00,       .00,    297.23,       .00,      2.96,
.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
444.89,    2761.26,   4458.15
    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
    9.8333,  61,       .00,       .00,    291.45,       .00,      2.87,
.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
   10.6667,  66,       .00,       .00,    277.71,       .00,      2.67,
.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
```

.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"Run on 2/17/2000 at 08:27:36"

"TIME", "CONCENTRATION"	"EXPOSURE",	"MEAN CONC.",	"NUM OF PUFFS"
"(min)", "(ppm)",	"(g-sec/m**3)",	"(ppm)"	
.000, 5.43E-01,	7.68E-03,	5.43E-01,	32
.083, 2.36E+00,	4.11E-02,	1.45E+00,	32
.167, 8.34E+00,	1.59E-01,	3.75E+00,	33
.250, 2.53E+01,	5.16E-01,	9.13E+00,	33
.333, 6.60E+01,	1.45E+00,	2.05E+01,	34
.417, 1.50E+02,	3.58E+00,	4.22E+01,	34
.500, 3.01E+02,	7.83E+00,	7.92E+01,	35
.583, 5.35E+02,	1.54E+01,	1.36E+02,	35
.667, 8.48E+02,	2.74E+01,	2.15E+02,	36
.750, 1.21E+03,	4.45E+01,	3.15E+02,	36
.833, 1.57E+03,	6.66E+01,	4.28E+02,	37
.917, 1.85E+03,	9.28E+01,	5.47E+02,	37
1.000, 2.01E+03,	1.21E+02,	6.60E+02,	38
1.083, 2.03E+03,	1.50E+02,	7.58E+02,	38
1.167, 1.92E+03,	1.77E+02,	8.35E+02,	39
1.250, 1.72E+03,	2.01E+02,	8.90E+02,	39
1.333, 1.47E+03,	2.22E+02,	9.25E+02,	40
1.417, 1.22E+03,	2.40E+02,	9.41E+02,	40
1.500, 1.00E+03,	2.54E+02,	9.44E+02,	41
1.583, 8.24E+02,	2.65E+02,	9.38E+02,	41
1.667, 6.89E+02,	2.75E+02,	9.26E+02,	42
1.750, 5.91E+02,	2.83E+02,	9.11E+02,	42
1.833, 5.22E+02,	2.91E+02,	8.94E+02,	43
1.917, 4.74E+02,	2.98E+02,	8.77E+02,	43
2.000, 4.40E+02,	3.04E+02,	8.59E+02,	44
2.083, 4.14E+02,	3.10E+02,	8.42E+02,	44
2.167, 3.94E+02,	3.15E+02,	8.26E+02,	45
2.250, 3.78E+02,	3.21E+02,	8.10E+02,	45
2.333, 3.64E+02,	3.26E+02,	7.94E+02,	46
2.417, 3.51E+02,	3.31E+02,	7.79E+02,	46
2.500, 3.40E+02,	3.35E+02,	7.65E+02,	47
2.583, 3.30E+02,	3.40E+02,	7.52E+02,	47
2.667, 3.20E+02,	3.45E+02,	7.39E+02,	48
2.750, 3.12E+02,	3.49E+02,	7.26E+02,	48
2.833, 3.04E+02,	3.53E+02,	7.14E+02,	49
2.917, 2.96E+02,	3.57E+02,	7.02E+02,	49
3.000, 2.89E+02,	3.62E+02,	6.91E+02,	50
3.083, 2.82E+02,	3.66E+02,	6.80E+02,	50
3.167, 2.76E+02,	3.69E+02,	6.70E+02,	51
3.250, 2.70E+02,	3.73E+02,	6.60E+02,	51
3.333, 2.64E+02,	3.77E+02,	6.50E+02,	52
3.417, 2.58E+02,	3.81E+02,	6.41E+02,	52
3.500, 2.53E+02,	3.84E+02,	6.32E+02,	53
3.583, 2.48E+02,	3.88E+02,	6.23E+02,	53
3.667, 2.44E+02,	3.91E+02,	6.15E+02,	54
3.750, 2.39E+02,	3.95E+02,	6.07E+02,	54

3.833,	2.35E+02,	3.98E+02,	5.99E+02,	55
3.917,	2.31E+02,	4.01E+02,	5.91E+02,	55
4.000,	2.27E+02,	4.04E+02,	5.84E+02,	56
4.083,	2.23E+02,	4.08E+02,	5.76E+02,	56
4.167,	2.19E+02,	4.11E+02,	5.69E+02,	57
4.250,	2.16E+02,	4.14E+02,	5.63E+02,	57
4.333,	2.12E+02,	4.17E+02,	5.56E+02,	58
4.417,	2.09E+02,	4.20E+02,	5.50E+02,	58
4.500,	2.06E+02,	4.23E+02,	5.43E+02,	59
4.583,	2.03E+02,	4.25E+02,	5.37E+02,	59
4.667,	2.00E+02,	4.28E+02,	5.31E+02,	60
4.750,	1.97E+02,	4.31E+02,	5.26E+02,	60
4.833,	1.94E+02,	4.34E+02,	5.20E+02,	61
4.917,	1.91E+02,	4.36E+02,	5.15E+02,	61
5.000,	1.89E+02,	4.39E+02,	5.09E+02,	62
5.083,	1.86E+02,	4.42E+02,	5.04E+02,	62
5.167,	1.84E+02,	4.44E+02,	4.99E+02,	63
5.250,	1.81E+02,	4.47E+02,	4.94E+02,	63
5.333,	1.79E+02,	4.49E+02,	4.89E+02,	64
5.417,	1.77E+02,	4.52E+02,	4.84E+02,	64
5.500,	1.75E+02,	4.54E+02,	4.80E+02,	65
5.583,	1.72E+02,	4.57E+02,	4.75E+02,	65
5.667,	1.70E+02,	4.59E+02,	4.71E+02,	66
5.750,	1.68E+02,	4.62E+02,	4.66E+02,	66
5.833,	1.66E+02,	4.64E+02,	4.62E+02,	67
5.917,	1.64E+02,	4.66E+02,	4.58E+02,	67
6.000,	1.62E+02,	4.69E+02,	4.54E+02,	68
6.083,	1.61E+02,	4.71E+02,	4.50E+02,	68
6.167,	1.59E+02,	4.73E+02,	4.46E+02,	69
6.250,	1.57E+02,	4.75E+02,	4.42E+02,	69
6.333,	1.55E+02,	4.78E+02,	4.39E+02,	70
6.417,	1.54E+02,	4.80E+02,	4.35E+02,	70
6.500,	1.52E+02,	4.82E+02,	4.31E+02,	71
6.583,	1.50E+02,	4.84E+02,	4.28E+02,	71
6.667,	1.49E+02,	4.86E+02,	4.24E+02,	72
6.750,	1.47E+02,	4.88E+02,	4.21E+02,	72
6.833,	1.46E+02,	4.90E+02,	4.18E+02,	73
6.917,	1.44E+02,	4.92E+02,	4.15E+02,	73
7.000,	1.43E+02,	4.94E+02,	4.11E+02,	74
7.083,	1.41E+02,	4.96E+02,	4.08E+02,	74
7.167,	1.40E+02,	4.98E+02,	4.05E+02,	75
7.250,	1.38E+02,	5.00E+02,	4.02E+02,	75
7.333,	1.37E+02,	5.02E+02,	3.99E+02,	76
7.417,	1.36E+02,	5.04E+02,	3.96E+02,	76
7.500,	1.34E+02,	5.06E+02,	3.93E+02,	77

RUN TRL12 - CHLORINE TRANS. ACCIDENT - 12 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:28:08

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	12.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                    (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                         =      Chlorine
Molecular Weight              (gm/mole) =       70.9
Heat of Vapor.                   (j/gm) =      288.0
Initial Boiling Point              (C) =      -34.1
Heat Capacity                 (j/gm-C) =        .946
Specific Gravity                          =      1.570
Diffusion Coef.           (cm**2/sec) =        .079


MODEL PARAMETERS:
Puff Release Interval                 (sec) =   10
Time Step                             (sec) =    5
Delay Between Release and Intake      (sec) =  300
Threshold Concentration               (ppm) =    3.28E-04
To convert ppm to g/m**3, multiply by       =    2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                    (ppm) =    5.29E+02
Exposure Two Minutes After Arrival  (g-sec/m**3) =    1.87E+02
Time From Plume Arrival to Max. Conc.     (sec) =   65.
Max. Conc. in Two Minutes After Arrival   (ppm) =    1.26E+03
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC12EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC12EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC12EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC12EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC12EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:28:08"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63,
.45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00,
444.89, 21029.15, 22726.03

.1667, 3, .00, .00, 648.58, .00, 24.67,
.43, 3.69, 42.88, .01, -34.10, 1035.00, 217.00,
444.89, 14869.85, 16566.74

.3333, 4, .00, .00, 628.73, .00, 19.85,
.41, 3.63, 41.31, .01, -34.10, 1035.00, 217.00,
444.89, 12141.18, 13838.07

.5000, 5, .00, .00, 611.75, .00, 16.98,
.40, 3.57, 40.05, .01, -34.10, 1035.00, 217.00,
444.89, 10514.57, 12211.46

.6667, 6, .00, .00, 596.73, .00, 15.02,
.39, 3.52, 38.97, .01, -34.10, 1035.00, 217.00,
444.89, 9404.52, 11101.41

.8333, 7, .00, .00, 583.16, .00, 13.57,
.38, 3.48, 38.01, .01, -34.10, 1035.00, 217.00,
444.89, 8585.11, 10282.00

1.0000, 8, .00, .00, 570.73, .00, 12.44,
.37, 3.44, 37.14, .01, -34.10, 1035.00, 217.00,
444.89, 7948.27, 9645.16

1.1667, 9, .00, .00, 559.20, .00, 11.53,
.36, 3.40, 36.35, .01, -34.10, 1035.00, 217.00,
444.89, 7434.93, 9131.81

1.3333, 10, .00, .00, 548.43, .00, 10.77,
.36, 3.37, 35.62, .01, -34.10, 1035.00, 217.00,
444.89, 7009.72, 8706.60

1.5000, 11, .00, .00, 538.31, .00, 10.12,
.35, 3.33, 34.93, .01, -34.10, 1035.00, 217.00,
444.89, 6650.00, 8346.89

1.6667, 12, .00, .00, 528.74, .00, 9.57,
.34, 3.30, 34.29, .01, -34.10, 1035.00, 217.00,
444.89, 6340.53, 8037.41

1.8333, 13, .00, .00, 519.66, .00, 9.08,
.34, 3.27, 33.68, .01, -34.10, 1035.00, 217.00,
444.89, 6070.59, 7767.48

2.0000, 14, .00, .00, 511.00, .00, 8.65,
.33, 3.25, 33.10, .01, -34.10, 1035.00, 217.00,
444.89, 5832.44, 7529.32

2.1667, 15, .00, .00, 502.73, .00, 8.27,
.33, 3.22, 32.55, .01, -34.10, 1035.00, 217.00,
444.89, 5620.28, 7317.16

2.3333, 16, .00, .00, 494.81, .00, 7.92,

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.32,        3.19,      32.02,        .01,     -34.10,    1035.00,     217.00,
444.89,    5429.70,    7126.59
    2.5000,  17,          .00,         .00,     487.20,         .00,       7.61,
.32,        3.17,      31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,    6954.17
    2.6667,  18,          .00,         .00,     479.88,         .00,       7.32,
.31,        3.14,      31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,    6797.20
    2.8333,  19,          .00,         .00,     472.81,         .00,       7.06,
.31,        3.12,      30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,    6653.50
    3.0000,  20,          .00,         .00,     465.99,         .00,       6.82,
.30,        3.10,      30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,    6521.30
    3.1667,  21,          .00,         .00,     459.40,         .00,       6.59,
.30,        3.07,      29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,    6399.15
    3.3333,  22,          .00,         .00,     453.01,         .00,       6.39,
.29,        3.05,      29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,    6285.82
    3.5000,  23,          .00,         .00,     446.82,         .00,       6.19,
.29,        3.03,      28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,    6180.32
    3.6667,  24,          .00,         .00,     440.81,         .00,       6.01,
.28,        3.01,      28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,    6081.77
    3.8333,  25,          .00,         .00,     434.97,         .00,       5.84,
.28,        2.99,      28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,    5989.44
    4.0000,  26,          .00,         .00,     429.29,         .00,       5.68,
.28,        2.97,      27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,    5902.72
    4.1667,  27,          .00,         .00,     423.77,         .00,       5.53,
.27,        2.95,      27.34,        .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,    5821.04
    4.3333,  28,          .00,         .00,     418.38,         .00,       5.38,
.27,        2.93,      26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,    5743.95
    4.5000,  29,          .00,         .00,     413.14,         .00,       5.25,
.27,        2.91,      26.65,        .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,    5671.02
    4.6667,  30,          .00,         .00,     408.02,         .00,       5.12,
.26,        2.89,      26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,    5601.90
    4.8333,  31,          .00,         .00,     403.02,         .00,       5.00,
.26,        2.88,      25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,    5536.27
    5.0000,  32,          .00,         .00,     398.14,         .00,       4.88,
.26,        2.86,      25.67,        .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,    5473.83
    5.1667,  33,          .00,         .00,     393.38,         .00,       4.77,
.25,        2.84,      25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,    5414.35
    5.3333,  34,          .00,         .00,     388.71,         .00,       4.66,
.25,        2.82,      25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,    5357.59
    5.5000,  35,          .00,         .00,     384.16,         .00,       4.56,
.25,        2.81,      24.76,        .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,    5303.36
    5.6667,  36,          .00,         .00,     379.69,         .00,       4.46,
.24,        2.79,      24.47,        .01,     -34.10,    1035.00,     217.00,
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444.89, 3554.57, 5251.46
5.8333, 37, .00, .00, 375.33, .00, 4.37,
.24, 2.77, 24.18, .01, -34.10, 1035.00, 217.00,
444.89, 3504.86, 5201.74
6.0000, 38, .00, .00, 371.05, .00, 4.28,
.24, 2.76, 23.91, .01, -34.10, 1035.00, 217.00,
444.89, 3457.17, 5154.06
6.1667, 39, .00, .00, 366.86, .00, 4.19,
.24, 2.74, 23.63, .01, -34.10, 1035.00, 217.00,
444.89, 3411.38, 5108.26
6.3333, 40, .00, .00, 362.75, .00, 4.11,
.23, 2.73, 23.37, .01, -34.10, 1035.00, 217.00,
444.89, 3367.36, 5064.25
6.5000, 41, .00, .00, 358.72, .00, 4.03,
.23, 2.71, 23.10, .01, -34.10, 1035.00, 217.00,
444.89, 3325.00, 5021.89
6.6667, 42, .00, .00, 354.77, .00, 3.95,
.23, 2.70, 22.85, .01, -34.10, 1035.00, 217.00,
444.89, 3284.20, 4981.09
6.8333, 43, .00, .00, 350.89, .00, 3.88,
.23, 2.68, 22.60, .01, -34.10, 1035.00, 217.00,
444.89, 3244.87, 4941.75
7.0000, 44, .00, .00, 347.08, .00, 3.81,
.22, 2.67, 22.35, .01, -34.10, 1035.00, 217.00,
444.89, 3206.91, 4903.80
7.1667, 45, .00, .00, 343.35, .00, 3.74,
.22, 2.65, 22.11, .01, -34.10, 1035.00, 217.00,
444.89, 3170.26, 4867.15
7.3333, 46, .00, .00, 339.68, .00, 3.67,
.22, 2.64, 21.87, .01, -34.10, 1035.00, 217.00,
444.89, 3134.84, 4831.73
7.5000, 47, .00, .00, 336.07, .00, 3.60,
.22, 2.62, 21.64, .01, -34.10, 1035.00, 217.00,
444.89, 3100.58, 4797.47
7.6667, 48, .00, .00, 332.53, .00, 3.54,
.21, 2.61, 21.41, .01, -34.10, 1035.00, 217.00,
444.89, 3067.42, 4764.30
7.8333, 49, .00, .00, 329.05, .00, 3.48,
.21, 2.60, 21.18, .01, -34.10, 1035.00, 217.00,
444.89, 3035.30, 4732.18
8.0000, 50, .00, .00, 325.63, .00, 3.42,
.21, 2.58, 20.96, .01, -34.10, 1035.00, 217.00,
444.89, 3004.16, 4701.05
8.1667, 51, .00, .00, 322.27, .00, 3.36,
.21, 2.57, 20.74, .01, -34.10, 1035.00, 217.00,
444.89, 2973.97, 4670.86
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.21, 2.56, 20.53, .01, -34.10, 1035.00, 217.00,
444.89, 2944.67, 4641.56
8.5000, 53, .00, .00, 315.71, .00, 3.25,
.20, 2.54, 20.32, .01, -34.10, 1035.00, 217.00,
444.89, 2916.22, 4613.10
8.6667, 54, .00, .00, 312.50, .00, 3.20,
.20, 2.53, 20.11, .01, -34.10, 1035.00, 217.00,
444.89, 2888.58, 4585.46
8.8333, 55, .00, .00, 309.35, .00, 3.15,
.20, 2.52, 19.90, .01, -34.10, 1035.00, 217.00,
444.89, 2861.70, 4558.59
9.0000, 56, .00, .00, 306.25, .00, 3.10,
.20, 2.50, 19.70, .01, -34.10, 1035.00, 217.00,
444.89, 2835.57, 4532.46

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    9.1667,  57,      .00,      .00,    303.20,      .00,     3.05,
.20,      2.49,    19.51,      .01,    -34.10,  1035.00,   217.00,
444.89,   2810.14,  4507.02
    9.3333,  58,      .00,      .00,    300.19,      .00,     3.01,
.19,      2.48,    19.31,      .01,    -34.10,  1035.00,   217.00,
444.89,   2785.38,  4482.27
    9.5000,  59,      .00,      .00,    297.23,      .00,     2.96,
.19,      2.47,    19.12,      .01,    -34.10,  1035.00,   217.00,
444.89,   2761.26,  4458.15
    9.6667,  60,      .00,      .00,    294.32,      .00,     2.92,
.19,      2.45,    18.93,      .01,    -34.10,  1035.00,   217.00,
444.89,   2737.76,  4434.65
    9.8333,  61,      .00,      .00,    291.45,      .00,     2.87,
.19,      2.44,    18.75,      .01,    -34.10,  1035.00,   217.00,
444.89,   2714.85,  4411.74
   10.0000,  62,      .00,      .00,    288.62,      .00,     2.83,
.19,      2.43,    18.56,      .01,    -34.10,  1035.00,   217.00,
444.89,   2692.51,  4389.39
   10.1667,  63,      .00,      .00,    285.83,      .00,     2.79,
.18,      2.42,    18.38,      .01,    -34.10,  1035.00,   217.00,
444.89,   2670.70,  4367.59
   10.3333,  64,      .00,      .00,    283.08,      .00,     2.75,
.18,      2.41,    18.21,      .01,    -34.10,  1035.00,   217.00,
444.89,   2649.42,  4346.31
   10.5000,  65,      .00,      .00,    280.37,      .00,     2.71,
.18,      2.40,    18.03,      .01,    -34.10,  1035.00,   217.00,
444.89,   2628.64,  4325.53
   10.6667,  66,      .00,      .00,    277.71,      .00,     2.67,
.18,      2.38,    17.86,      .01,    -34.10,  1035.00,   217.00,
444.89,   2608.34,  4305.23
   10.8333,  67,      .00,      .00,    275.07,      .00,     2.63,
.18,      2.37,    17.69,      .01,    -34.10,  1035.00,   217.00,
444.89,   2588.51,  4285.40
   11.0000,  68,      .00,      .00,    272.48,      .00,     2.60,
.18,      2.36,    17.52,      .01,    -34.10,  1035.00,   217.00,
444.89,   2569.12,  4266.01
   11.1667,  69,      .00,      .00,    269.92,      .00,     2.56,
.17,      2.35,    17.36,      .01,    -34.10,  1035.00,   217.00,
444.89,   2550.16,  4247.05
   11.3333,  70,      .00,      .00,    267.39,      .00,     2.52,
.17,      2.34,    17.19,      .01,    -34.10,  1035.00,   217.00,
444.89,   2531.61,  4228.50
   11.5000,  71,      .00,      .00,    264.90,      .00,     2.49,
.17,      2.33,    17.03,      .01,    -34.10,  1035.00,   217.00,
444.89,   2513.46,  4210.35
   11.6667,  72,      .00,      .00,    262.45,      .00,     2.46,
.17,      2.32,    16.87,      .01,    -34.10,  1035.00,   217.00,
444.89,   2495.70,  4192.59
   11.8333,  73,      .00,      .00,    260.02,      .00,     2.42,
.17,      2.31,    16.72,      .01,    -34.10,  1035.00,   217.00,
444.89,   2478.31,  4175.20
   12.0000,  74,      .00,      .00,    257.63,      .00,     2.39,
.17,      2.30,    16.56,      .01,    -34.10,  1035.00,   217.00,
444.89,   2461.28,  4158.16
   12.1667,  75,      .00,      .00,    255.27,      .00,     2.36,
.16,      2.29,    16.41,      .01,    -34.10,  1035.00,   217.00,
444.89,   2444.59,  4141.48
   12.3333,  76,      .00,      .00,    252.95,      .00,     2.33,
.16,      2.27,    16.26,      .01,    -34.10,  1035.00,   217.00,
444.89,   2428.24,  4125.12
   12.5000,  77,      .00,      .00,    250.65,      .00,     2.30,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:28:08"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	3.01E-01,	4.26E-03,	3.01E-01,	32
.083,	1.32E+00,	2.29E-02,	8.11E-01,	32
.167,	4.71E+00,	8.96E-02,	2.11E+00,	33
.250,	1.44E+01,	2.94E-01,	5.19E+00,	33
.333,	3.81E+01,	8.33E-01,	1.18E+01,	34
.417,	8.77E+01,	2.07E+00,	2.44E+01,	34
.500,	1.77E+02,	4.58E+00,	4.63E+01,	35
.583,	3.18E+02,	9.08E+00,	8.02E+01,	35
.667,	5.09E+02,	1.63E+01,	1.28E+02,	36
.750,	7.32E+02,	2.66E+01,	1.88E+02,	36
.833,	9.55E+02,	4.01E+01,	2.58E+02,	37
.917,	1.14E+03,	5.62E+01,	3.31E+02,	37
1.000,	1.25E+03,	7.38E+01,	4.02E+02,	38
1.083,	1.26E+03,	9.17E+01,	4.63E+02,	38
1.167,	1.20E+03,	1.09E+02,	5.12E+02,	39
1.250,	1.08E+03,	1.24E+02,	5.48E+02,	39
1.333,	9.22E+02,	1.37E+02,	5.70E+02,	40
1.417,	7.65E+02,	1.48E+02,	5.80E+02,	40
1.500,	6.25E+02,	1.57E+02,	5.83E+02,	41
1.583,	5.10E+02,	1.64E+02,	5.79E+02,	41
1.667,	4.23E+02,	1.70E+02,	5.72E+02,	42
1.750,	3.60E+02,	1.75E+02,	5.62E+02,	42
1.833,	3.16E+02,	1.79E+02,	5.51E+02,	43
1.917,	2.85E+02,	1.83E+02,	5.40E+02,	43
2.000,	2.63E+02,	1.87E+02,	5.29E+02,	44
2.083,	2.47E+02,	1.91E+02,	5.18E+02,	44
2.167,	2.35E+02,	1.94E+02,	5.08E+02,	45
2.250,	2.25E+02,	1.97E+02,	4.98E+02,	45
2.333,	2.16E+02,	2.00E+02,	4.88E+02,	46
2.417,	2.09E+02,	2.03E+02,	4.79E+02,	46
2.500,	2.02E+02,	2.06E+02,	4.70E+02,	47
2.583,	1.96E+02,	2.09E+02,	4.61E+02,	47
2.667,	1.90E+02,	2.11E+02,	4.53E+02,	48
2.750,	1.85E+02,	2.14E+02,	4.45E+02,	48
2.833,	1.80E+02,	2.17E+02,	4.38E+02,	49
2.917,	1.76E+02,	2.19E+02,	4.30E+02,	49
3.000,	1.71E+02,	2.21E+02,	4.23E+02,	50
3.083,	1.67E+02,	2.24E+02,	4.17E+02,	50
3.167,	1.64E+02,	2.26E+02,	4.10E+02,	51
3.250,	1.60E+02,	2.28E+02,	4.04E+02,	51
3.333,	1.57E+02,	2.31E+02,	3.98E+02,	52
3.417,	1.53E+02,	2.33E+02,	3.92E+02,	52
3.500,	1.50E+02,	2.35E+02,	3.86E+02,	53
3.583,	1.47E+02,	2.37E+02,	3.81E+02,	53
3.667,	1.45E+02,	2.39E+02,	3.76E+02,	54
3.750,	1.42E+02,	2.41E+02,	3.71E+02,	54

3.833,	1.39E+02,	2.43E+02,	3.66E+02,	55
3.917,	1.37E+02,	2.45E+02,	3.61E+02,	55
4.000,	1.35E+02,	2.47E+02,	3.56E+02,	56
4.083,	1.32E+02,	2.49E+02,	3.52E+02,	56
4.167,	1.30E+02,	2.51E+02,	3.47E+02,	57
4.250,	1.28E+02,	2.52E+02,	3.43E+02,	57
4.333,	1.26E+02,	2.54E+02,	3.39E+02,	58
4.417,	1.24E+02,	2.56E+02,	3.35E+02,	58
4.500,	1.22E+02,	2.58E+02,	3.31E+02,	59
4.583,	1.20E+02,	2.59E+02,	3.28E+02,	59
4.667,	1.19E+02,	2.61E+02,	3.24E+02,	60
4.750,	1.17E+02,	2.63E+02,	3.20E+02,	60
4.833,	1.15E+02,	2.64E+02,	3.17E+02,	61
4.917,	1.14E+02,	2.66E+02,	3.13E+02,	61
5.000,	1.12E+02,	2.67E+02,	3.10E+02,	62
5.083,	1.10E+02,	2.69E+02,	3.07E+02,	62
5.167,	1.09E+02,	2.71E+02,	3.04E+02,	63
5.250,	1.08E+02,	2.72E+02,	3.01E+02,	63
5.333,	1.06E+02,	2.74E+02,	2.98E+02,	64
5.417,	1.05E+02,	2.75E+02,	2.95E+02,	64
5.500,	1.04E+02,	2.77E+02,	2.92E+02,	65
5.583,	1.02E+02,	2.78E+02,	2.89E+02,	65
5.667,	1.01E+02,	2.79E+02,	2.86E+02,	66
5.750,	9.98E+01,	2.81E+02,	2.84E+02,	66
5.833,	9.86E+01,	2.82E+02,	2.81E+02,	67
5.917,	9.74E+01,	2.84E+02,	2.79E+02,	67
6.000,	9.63E+01,	2.85E+02,	2.76E+02,	68
6.083,	9.52E+01,	2.86E+02,	2.74E+02,	68
6.167,	9.41E+01,	2.88E+02,	2.71E+02,	69
6.250,	9.30E+01,	2.89E+02,	2.69E+02,	69
6.333,	9.20E+01,	2.90E+02,	2.67E+02,	70
6.417,	9.10E+01,	2.92E+02,	2.64E+02,	70
6.500,	9.00E+01,	2.93E+02,	2.62E+02,	71
6.583,	8.91E+01,	2.94E+02,	2.60E+02,	71
6.667,	8.81E+01,	2.95E+02,	2.58E+02,	72
6.750,	8.72E+01,	2.97E+02,	2.56E+02,	72
6.833,	8.63E+01,	2.98E+02,	2.54E+02,	73
6.917,	8.54E+01,	2.99E+02,	2.52E+02,	73
7.000,	8.45E+01,	3.00E+02,	2.50E+02,	74
7.083,	8.37E+01,	3.01E+02,	2.48E+02,	74
7.167,	8.28E+01,	3.03E+02,	2.46E+02,	75
7.250,	8.20E+01,	3.04E+02,	2.44E+02,	75
7.333,	8.12E+01,	3.05E+02,	2.42E+02,	76
7.417,	8.04E+01,	3.06E+02,	2.40E+02,	76
7.500,	7.97E+01,	3.07E+02,	2.39E+02,	77

M00-0002 R0
ATT 10 - Pg 1

RUN TRC14 - CHLORINE TRANS. ACCIDENT - 14 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating Concentrations Of Toxic Substances At Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:28:41

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	14.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                     =       Chlorine
Molecular Weight          (gm/mole)   =        70.9
Heat of Vapor.               (j/gm)   =       288.0
Initial Boiling Point          (C)    =       -34.1
Heat Capacity             (j/gm-C)    =         .946
Specific Gravity                      =        1.570
Diffusion Coef.        (cm**2/sec)    =         .079


MODEL PARAMETERS:
Puff Release Interval              (sec) =   10
Time Step                          (sec) =    5
Delay Between Release and Intake   (sec) =  300
Threshold Concentration            (ppm) =    3.14E-04
To convert ppm to g/m**3, multiply by       2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                  (ppm) =    2.99E+02
Exposure Two Minutes After Arrival    (g-sec/m**3) =    1.06E+02
Time From Plume Arrival to Max. Conc.        (sec) =   65.
Max. Conc. in Two Minutes After Arrival      (ppm) =    7.23E+02
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC14EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC14EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC14EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC14EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC14EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:28:41"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

.1667, 3, .00, .00, 648.58, .00, 24.67, .43, 3.69, 42.88, .01, -34.10, 1035.00, 217.00, 444.89, 14869.85, 16566.74

.3333, 4, .00, .00, 628.73, .00, 19.85, .41, 3.63, 41.31, .01, -34.10, 1035.00, 217.00, 444.89, 12141.18, 13838.07

.5000, 5, .00, .00, 611.75, .00, 16.98, .40, 3.57, 40.05, .01, -34.10, 1035.00, 217.00, 444.89, 10514.57, 12211.46

.6667, 6, .00, .00, 596.73, .00, 15.02, .39, 3.52, 38.97, .01, -34.10, 1035.00, 217.00, 444.89, 9404.52, 11101.41

.8333, 7, .00, .00, 583.16, .00, 13.57, .38, 3.48, 38.01, .01, -34.10, 1035.00, 217.00, 444.89, 8585.11, 10282.00

1.0000, 8, .00, .00, 570.73, .00, 12.44, .37, 3.44, 37.14, .01, -34.10, 1035.00, 217.00, 444.89, 7948.27, 9645.16

1.1667, 9, .00, .00, 559.20, .00, 11.53, .36, 3.40, 36.35, .01, -34.10, 1035.00, 217.00, 444.89, 7434.93, 9131.81

1.3333, 10, .00, .00, 548.43, .00, 10.77, .36, 3.37, 35.62, .01, -34.10, 1035.00, 217.00, 444.89, 7009.72, 8706.60

1.5000, 11, .00, .00, 538.31, .00, 10.12, .35, 3.33, 34.93, .01, -34.10, 1035.00, 217.00, 444.89, 6650.00, 8346.89

1.6667, 12, .00, .00, 528.74, .00, 9.57, .34, 3.30, 34.29, .01, -34.10, 1035.00, 217.00, 444.89, 6340.53, 8037.41

1.8333, 13, .00, .00, 519.66, .00, 9.08, .34, 3.27, 33.68, .01, -34.10, 1035.00, 217.00, 444.89, 6070.59, 7767.48

2.0000, 14, .00, .00, 511.00, .00, 8.65, .33, 3.25, 33.10, .01, -34.10, 1035.00, 217.00, 444.89, 5832.44, 7529.32

2.1667, 15, .00, .00, 502.73, .00, 8.27, .33, 3.22, 32.55, .01, -34.10, 1035.00, 217.00, 444.89, 5620.28, 7317.16

2.3333, 16, .00, .00, 494.81, .00, 7.92,

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.32,        3.19,       32.02,        .01,     -34.10,    1035.00,     217.00,
444.89,    5429.70,     7126.59
    2.5000,   17,          .00,        .00,     487.20,         .00,        7.61,
.32,        3.17,       31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,     6954.17
    2.6667,   18,          .00,        .00,     479.88,         .00,        7.32,
.31,        3.14,       31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,     6797.20
    2.8333,   19,          .00,        .00,     472.81,         .00,        7.06,
.31,        3.12,       30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,     6653.50
    3.0000,   20,          .00,        .00,     465.99,         .00,        6.82,
.30,        3.10,       30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,     6521.30
    3.1667,   21,          .00,        .00,     459.40,         .00,        6.59,
.30,        3.07,       29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,     6399.15
    3.3333,   22,          .00,        .00,     453.01,         .00,        6.39,
.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,     6285.82
    3.5000,   23,          .00,        .00,     446.82,         .00,        6.19,
.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
    3.6667,   24,          .00,        .00,     440.81,         .00,        6.01,
.28,        3.01,       28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,     6081.77
    3.8333,   25,          .00,        .00,     434.97,         .00,        5.84,
.28,        2.99,       28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,     5989.44
    4.0000,   26,          .00,        .00,     429.29,         .00,        5.68,
.28,        2.97,       27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,     5902.72
    4.1667,   27,          .00,        .00,     423.77,         .00,        5.53,
.27,        2.95,       27.34,        .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,     5821.04
    4.3333,   28,          .00,        .00,     418.38,         .00,        5.38,
.27,        2.93,       26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,     5743.95
    4.5000,   29,          .00,        .00,     413.14,         .00,        5.25,
.27,        2.91,       26.65,        .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,     5671.02
    4.6667,   30,          .00,        .00,     408.02,         .00,        5.12,
.26,        2.89,       26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,     5601.90
    4.8333,   31,          .00,        .00,     403.02,         .00,        5.00,
.26,        2.88,       25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,     5536.27
    5.0000,   32,          .00,        .00,     398.14,         .00,        4.88,
.26,        2.86,       25.67,        .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,     5473.83
    5.1667,   33,          .00,        .00,     393.38,         .00,        4.77,
.25,        2.84,       25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,     5414.35
    5.3333,   34,          .00,        .00,     388.71,         .00,        4.66,
.25,        2.82,       25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,     5357.59
    5.5000,   35,          .00,        .00,     384.16,         .00,        4.56,
.25,        2.81,       24.76,        .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,     5303.36
    5.6667,   36,          .00,        .00,     379.69,         .00,        4.46,
.24,        2.79,       24.47,        .01,     -34.10,    1035.00,     217.00,
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444.89, 3554.57, 5251.46
5.8333, 37, .00, .00, 375.33, .00, 4.37,
.24, 2.77, 24.18, .01, -34.10, 1035.00, 217.00,
444.89, 3504.86, 5201.74
6.0000, 38, .00, .00, 371.05, .00, 4.28,
.24, 2.76, 23.91, .01, -34.10, 1035.00, 217.00,
444.89, 3457.17, 5154.06
6.1667, 39, .00, .00, 366.86, .00, 4.19,
.24, 2.74, 23.63, .01, -34.10, 1035.00, 217.00,
444.89, 3411.38, 5108.26
6.3333, 40, .00, .00, 362.75, .00, 4.11,
.23, 2.73, 23.37, .01, -34.10, 1035.00, 217.00,
444.89, 3367.36, 5064.25
6.5000, 41, .00, .00, 358.72, .00, 4.03,
.23, 2.71, 23.10, .01, -34.10, 1035.00, 217.00,
444.89, 3325.00, 5021.89
6.6667, 42, .00, .00, 354.77, .00, 3.95,
.23, 2.70, 22.85, .01, -34.10, 1035.00, 217.00,
444.89, 3284.20, 4981.09
6.8333, 43, .00, .00, 350.89, .00, 3.88,
.23, 2.68, 22.60, .01, -34.10, 1035.00, 217.00,
444.89, 3244.87, 4941.75
7.0000, 44, .00, .00, 347.08, .00, 3.81,
.22, 2.67, 22.35, .01, -34.10, 1035.00, 217.00,
444.89, 3206.91, 4903.80
7.1667, 45, .00, .00, 343.35, .00, 3.74,
.22, 2.65, 22.11, .01, -34.10, 1035.00, 217.00,
444.89, 3170.26, 4867.15
7.3333, 46, .00, .00, 339.68, .00, 3.67,
.22, 2.64, 21.87, .01, -34.10, 1035.00, 217.00,
444.89, 3134.84, 4831.73
7.5000, 47, .00, .00, 336.07, .00, 3.60,
.22, 2.62, 21.64, .01, -34.10, 1035.00, 217.00,
444.89, 3100.58, 4797.47
7.6667, 48, .00, .00, 332.53, .00, 3.54,
.21, 2.61, 21.41, .01, -34.10, 1035.00, 217.00,
444.89, 3067.42, 4764.30
7.8333, 49, .00, .00, 329.05, .00, 3.48,
.21, 2.60, 21.18, .01, -34.10, 1035.00, 217.00,
444.89, 3035.30, 4732.18
8.0000, 50, .00, .00, 325.63, .00, 3.42,
.21, 2.58, 20.96, .01, -34.10, 1035.00, 217.00,
444.89, 3004.16, 4701.05
8.1667, 51, .00, .00, 322.27, .00, 3.36,
.21, 2.57, 20.74, .01, -34.10, 1035.00, 217.00,
444.89, 2973.97, 4670.86
8.3333, 52, .00, .00, 318.96, .00, 3.31,
.21, 2.56, 20.53, .01, -34.10, 1035.00, 217.00,
444.89, 2944.67, 4641.56
8.5000, 53, .00, .00, 315.71, .00, 3.25,
.20, 2.54, 20.32, .01, -34.10, 1035.00, 217.00,
444.89, 2916.22, 4613.10
8.6667, 54, .00, .00, 312.50, .00, 3.20,
.20, 2.53, 20.11, .01, -34.10, 1035.00, 217.00,
444.89, 2888.58, 4585.46
8.8333, 55, .00, .00, 309.35, .00, 3.15,
.20, 2.52, 19.90, .01, -34.10, 1035.00, 217.00,
444.89, 2861.70, 4558.59
9.0000, 56, .00, .00, 306.25, .00, 3.10,
.20, 2.50, 19.70, .01, -34.10, 1035.00, 217.00,
444.89, 2835.57, 4532.46

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    9.1667,  57,      .00,      .00,    303.20,      .00,     3.05,
.20,      2.49,    19.51,      .01,    -34.10,  1035.00,   217.00,
444.89,   2810.14,  4507.02
    9.3333,  58,      .00,      .00,    300.19,      .00,     3.01,
.19,      2.48,    19.31,      .01,    -34.10,  1035.00,   217.00,
444.89,   2785.38,  4482.27
    9.5000,  59,      .00,      .00,    297.23,      .00,     2.96,
.19,      2.47,    19.12,      .01,    -34.10,  1035.00,   217.00,
444.89,   2761.26,  4458.15
    9.6667,  60,      .00,      .00,    294.32,      .00,     2.92,
.19,      2.45,    18.93,      .01,    -34.10,  1035.00,   217.00,
444.89,   2737.76,  4434.65
    9.8333,  61,      .00,      .00,    291.45,      .00,     2.87,
.19,      2.44,    18.75,      .01,    -34.10,  1035.00,   217.00,
444.89,   2714.85,  4411.74
   10.0000,  62,      .00,      .00,    288.62,      .00,     2.83,
.19,      2.43,    18.56,      .01,    -34.10,  1035.00,   217.00,
444.89,   2692.51,  4389.39
   10.1667,  63,      .00,      .00,    285.83,      .00,     2.79,
.18,      2.42,    18.38,      .01,    -34.10,  1035.00,   217.00,
444.89,   2670.70,  4367.59
   10.3333,  64,      .00,      .00,    283.08,      .00,     2.75,
.18,      2.41,    18.21,      .01,    -34.10,  1035.00,   217.00,
444.89,   2649.42,  4346.31
   10.5000,  65,      .00,      .00,    280.37,      .00,     2.71,
.18,      2.40,    18.03,      .01,    -34.10,  1035.00,   217.00,
444.89,   2628.64,  4325.53
   10.6667,  66,      .00,      .00,    277.71,      .00,     2.67,
.18,      2.38,    17.86,      .01,    -34.10,  1035.00,   217.00,
444.89,   2608.34,  4305.23
   10.8333,  67,      .00,      .00,    275.07,      .00,     2.63,
.18,      2.37,    17.69,      .01,    -34.10,  1035.00,   217.00,
444.89,   2588.51,  4285.40
   11.0000,  68,      .00,      .00,    272.48,      .00,     2.60,
.18,      2.36,    17.52,      .01,    -34.10,  1035.00,   217.00,
444.89,   2569.12,  4266.01
   11.1667,  69,      .00,      .00,    269.92,      .00,     2.56,
.17,      2.35,    17.36,      .01,    -34.10,  1035.00,   217.00,
444.89,   2550.16,  4247.05
   11.3333,  70,      .00,      .00,    267.39,      .00,     2.52,
.17,      2.34,    17.19,      .01,    -34.10,  1035.00,   217.00,
444.89,   2531.61,  4228.50
   11.5000,  71,      .00,      .00,    264.90,      .00,     2.49,
.17,      2.33,    17.03,      .01,    -34.10,  1035.00,   217.00,
444.89,   2513.46,  4210.35
   11.6667,  72,      .00,      .00,    262.45,      .00,     2.46,
.17,      2.32,    16.87,      .01,    -34.10,  1035.00,   217.00,
444.89,   2495.70,  4192.59
   11.8333,  73,      .00,      .00,    260.02,      .00,     2.42,
.17,      2.31,    16.72,      .01,    -34.10,  1035.00,   217.00,
444.89,   2478.31,  4175.20
   12.0000,  74,      .00,      .00,    257.63,      .00,     2.39,
.17,      2.30,    16.56,      .01,    -34.10,  1035.00,   217.00,
444.89,   2461.28,  4158.16
   12.1667,  75,      .00,      .00,    255.27,      .00,     2.36,
.16,      2.29,    16.41,      .01,    -34.10,  1035.00,   217.00,
444.89,   2444.59,  4141.48
   12.3333,  76,      .00,      .00,    252.95,      .00,     2.33,
.16,      2.27,    16.26,      .01,    -34.10,  1035.00,   217.00,
444.89,   2428.24,  4125.12
   12.5000,  77,      .00,      .00,    250.65,      .00,     2.30,
```

.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"Run on 2/17/2000 at 08:28:41"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	1.50E-01,	2.12E-03,	1.50E-01,	32
.083,	6.64E-01,	1.15E-02,	4.07E-01,	32
.167,	2.40E+00,	4.55E-02,	1.07E+00,	33
.250,	7.45E+00,	1.51E-01,	2.67E+00,	33
.333,	1.99E+01,	4.33E-01,	6.12E+00,	34
.417,	4.64E+01,	1.09E+00,	1.28E+01,	34
.500,	9.50E+01,	2.43E+00,	2.46E+01,	35
.583,	1.72E+02,	4.87E+00,	4.30E+01,	35
.667,	2.79E+02,	8.81E+00,	6.92E+01,	36
.750,	4.05E+02,	1.45E+01,	1.03E+02,	36
.833,	5.33E+02,	2.21E+01,	1.42E+02,	37
.917,	6.41E+02,	3.11E+01,	1.83E+02,	37
1.000,	7.07E+02,	4.11E+01,	2.24E+02,	38
1.083,	7.23E+02, MAX	5.14E+01,	2.59E+02,	38
1.167,	6.90E+02,	6.11E+01,	2.88E+02,	39
1.250,	6.21E+02,	6.99E+01,	3.09E+02,	39
1.333,	5.33E+02,	7.74E+01,	3.22E+02,	40
1.417,	4.42E+02,	8.37E+01,	3.29E+02,	40
1.500,	3.59E+02,	8.88E+01,	3.30E+02,	41
1.583,	2.91E+02,	9.29E+01,	3.28E+02,	41
1.667,	2.39E+02,	9.62E+01,	3.24E+02,	42
1.750,	2.01E+02,	9.91E+01,	3.19E+02,	42
1.833,	1.75E+02,	1.02E+02,	3.12E+02,	43
1.917,	1.57E+02,	1.04E+02,	3.06E+02,	43
2.000,	1.44E+02,	1.06E+02,	2.99E+02,	44
2.083,	1.35E+02,	1.08E+02,	2.93E+02,	44
2.167,	1.28E+02,	1.10E+02,	2.87E+02,	45
2.250,	1.22E+02,	1.11E+02,	2.81E+02,	45
2.333,	1.17E+02,	1.13E+02,	2.75E+02,	46
2.417,	1.13E+02,	1.14E+02,	2.70E+02,	46
2.500,	1.09E+02,	1.16E+02,	2.65E+02,	47
2.583,	1.06E+02,	1.18E+02,	2.60E+02,	47
2.667,	1.03E+02,	1.19E+02,	2.55E+02,	48
2.750,	1.00E+02,	1.20E+02,	2.50E+02,	48
2.833,	9.75E+01,	1.22E+02,	2.46E+02,	49
2.917,	9.51E+01,	1.23E+02,	2.42E+02,	49
3.000,	9.27E+01,	1.24E+02,	2.38E+02,	50
3.083,	9.05E+01,	1.26E+02,	2.34E+02,	50
3.167,	8.85E+01,	1.27E+02,	2.30E+02,	51
3.250,	8.65E+01,	1.28E+02,	2.27E+02,	51
3.333,	8.47E+01,	1.29E+02,	2.23E+02,	52
3.417,	8.29E+01,	1.31E+02,	2.20E+02,	52
3.500,	8.13E+01,	1.32E+02,	2.17E+02,	53
3.583,	7.97E+01,	1.33E+02,	2.14E+02,	53
3.667,	7.81E+01,	1.34E+02,	2.11E+02,	54
3.750,	7.67E+01,	1.35E+02,	2.08E+02,	54

3.833,	7.53E+01,	1.36E+02,	2.05E+02,	55
3.917,	7.40E+01,	1.37E+02,	2.02E+02,	55
4.000,	7.27E+01,	1.38E+02,	1.99E+02,	56
4.083,	7.15E+01,	1.39E+02,	1.97E+02,	56
4.167,	7.03E+01,	1.40E+02,	1.94E+02,	57
4.250,	6.91E+01,	1.41E+02,	1.92E+02,	57
4.333,	6.80E+01,	1.42E+02,	1.90E+02,	58
4.417,	6.70E+01,	1.43E+02,	1.87E+02,	58
4.500,	6.60E+01,	1.44E+02,	1.85E+02,	59
4.583,	6.50E+01,	1.45E+02,	1.83E+02,	59
4.667,	6.40E+01,	1.46E+02,	1.81E+02,	60
4.750,	6.31E+01,	1.47E+02,	1.79E+02,	60
4.833,	6.22E+01,	1.48E+02,	1.77E+02,	61
4.917,	6.13E+01,	1.48E+02,	1.75E+02,	61
5.000,	6.05E+01,	1.49E+02,	1.73E+02,	62
5.083,	5.97E+01,	1.50E+02,	1.71E+02,	62
5.167,	5.89E+01,	1.51E+02,	1.70E+02,	63
5.250,	5.81E+01,	1.52E+02,	1.68E+02,	63
5.333,	5.73E+01,	1.53E+02,	1.66E+02,	64
5.417,	5.66E+01,	1.53E+02,	1.64E+02,	64
5.500,	5.59E+01,	1.54E+02,	1.63E+02,	65
5.583,	5.52E+01,	1.55E+02,	1.61E+02,	65
5.667,	5.45E+01,	1.56E+02,	1.60E+02,	66
5.750,	5.39E+01,	1.57E+02,	1.58E+02,	66
5.833,	5.32E+01,	1.57E+02,	1.57E+02,	67
5.917,	5.26E+01,	1.58E+02,	1.55E+02,	67
6.000,	5.20E+01,	1.59E+02,	1.54E+02,	68
6.083,	5.14E+01,	1.59E+02,	1.52E+02,	68
6.167,	5.08E+01,	1.60E+02,	1.51E+02,	69
6.250,	5.02E+01,	1.61E+02,	1.50E+02,	69
6.333,	4.97E+01,	1.62E+02,	1.48E+02,	70
6.417,	4.91E+01,	1.62E+02,	1.47E+02,	70
6.500,	4.86E+01,	1.63E+02,	1.46E+02,	71
6.583,	4.81E+01,	1.64E+02,	1.45E+02,	71
6.667,	4.76E+01,	1.64E+02,	1.44E+02,	72
6.750,	4.71E+01,	1.65E+02,	1.42E+02,	72
6.833,	4.66E+01,	1.66E+02,	1.41E+02,	73
6.917,	4.61E+01,	1.66E+02,	1.40E+02,	73
7.000,	4.56E+01,	1.67E+02,	1.39E+02,	74
7.083,	4.52E+01,	1.68E+02,	1.38E+02,	74
7.167,	4.47E+01,	1.68E+02,	1.37E+02,	75
7.250,	4.43E+01,	1.69E+02,	1.36E+02,	75
7.333,	4.38E+01,	1.69E+02,	1.35E+02,	76
7.417,	4.34E+01,	1.70E+02,	1.34E+02,	76
7.500,	4.30E+01,	1.71E+02,	1.33E+02,	77

RUN TRL16 - CHLORINE TRANS. ACCIDENT - 16 METER RELEASE

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:29:20

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	16.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	3.00E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	1.56E+02
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	5.50E+01
Time From Plume Arrival to Max. Conc.	(sec)	=	65.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	3.80E+02

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC16EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC16EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC16EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC16EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC16EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:29:20"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

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.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,     6285.82
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.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
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444.89,    4205.83,     5902.72
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.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
```

.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:29:20"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	6.70E-02,	9.48E-04,	6.70E-02,	32
.083,	3.00E-01,	5.20E-03,	1.84E-01,	32
.167,	1.11E+00,	2.08E-02,	4.91E-01,	33
.250,	3.48E+00,	7.00E-02,	1.24E+00,	33
.333,	9.45E+00,	2.04E-01,	2.88E+00,	34
.417,	2.23E+01,	5.19E-01,	6.12E+00,	34
.500,	4.63E+01,	1.17E+00,	1.19E+01,	35
.583,	8.50E+01,	2.38E+00,	2.10E+01,	35
.667,	1.39E+02,	4.34E+00,	3.41E+01,	36
.750,	2.05E+02,	7.24E+00,	5.12E+01,	36
.833,	2.73E+02,	1.11E+01,	7.14E+01,	37
.917,	3.31E+02,	1.58E+01,	9.30E+01,	37
1.000,	3.69E+02,	2.10E+01,	1.14E+02,	38
1.083,	3.80E+02, MAX	2.64E+01,	1.33E+02,	38
1.167,	3.66E+02,	3.15E+01,	1.49E+02,	39
1.250,	3.31E+02,	3.62E+01,	1.60E+02,	39
1.333,	2.84E+02,	4.02E+01,	1.67E+02,	40
1.417,	2.35E+02,	4.36E+01,	1.71E+02,	40
1.500,	1.91E+02,	4.63E+01,	1.72E+02,	41
1.583,	1.53E+02,	4.84E+01,	1.71E+02,	41
1.667,	1.24E+02,	5.02E+01,	1.69E+02,	42
1.750,	1.03E+02,	5.17E+01,	1.66E+02,	42
1.833,	8.89E+01,	5.29E+01,	1.63E+02,	43
1.917,	7.88E+01,	5.40E+01,	1.59E+02,	43
2.000,	7.19E+01,	5.50E+01,	1.56E+02,	44
2.083,	6.69E+01,	5.60E+01,	1.52E+02,	44
2.167,	6.33E+01,	5.69E+01,	1.49E+02,	45
2.250,	6.04E+01,	5.77E+01,	1.46E+02,	45
2.333,	5.80E+01,	5.86E+01,	1.43E+02,	46
2.417,	5.59E+01,	5.93E+01,	1.40E+02,	46
2.500,	5.41E+01,	6.01E+01,	1.37E+02,	47
2.583,	5.24E+01,	6.09E+01,	1.34E+02,	47
2.667,	5.08E+01,	6.16E+01,	1.32E+02,	48
2.750,	4.94E+01,	6.23E+01,	1.30E+02,	48
2.833,	4.81E+01,	6.29E+01,	1.27E+02,	49
2.917,	4.69E+01,	6.36E+01,	1.25E+02,	49
3.000,	4.57E+01,	6.43E+01,	1.23E+02,	50
3.083,	4.46E+01,	6.49E+01,	1.21E+02,	50
3.167,	4.36E+01,	6.55E+01,	1.19E+02,	51
3.250,	4.27E+01,	6.61E+01,	1.17E+02,	51
3.333,	4.17E+01,	6.67E+01,	1.15E+02,	52
3.417,	4.09E+01,	6.73E+01,	1.13E+02,	52
3.500,	4.00E+01,	6.78E+01,	1.12E+02,	53
3.583,	3.93E+01,	6.84E+01,	1.10E+02,	53
3.667,	3.85E+01,	6.89E+01,	1.08E+02,	54
3.750,	3.78E+01,	6.95E+01,	1.07E+02,	54

3.833,	3.71E+01,	7.00E+01,	1.05E+02,	55
3.917,	3.64E+01,	7.05E+01,	1.04E+02,	55
4.000,	3.58E+01,	7.10E+01,	1.03E+02,	56
4.083,	3.52E+01,	7.15E+01,	1.01E+02,	56
4.167,	3.46E+01,	7.20E+01,	9.99E+01,	57
4.250,	3.40E+01,	7.25E+01,	9.86E+01,	57
4.333,	3.35E+01,	7.30E+01,	9.74E+01,	58
4.417,	3.30E+01,	7.34E+01,	9.62E+01,	58
4.500,	3.25E+01,	7.39E+01,	9.50E+01,	59
4.583,	3.20E+01,	7.43E+01,	9.39E+01,	59
4.667,	3.15E+01,	7.48E+01,	9.28E+01,	60
4.750,	3.11E+01,	7.52E+01,	9.17E+01,	60
4.833,	3.06E+01,	7.57E+01,	9.07E+01,	61
4.917,	3.02E+01,	7.61E+01,	8.97E+01,	61
5.000,	2.98E+01,	7.65E+01,	8.87E+01,	62
5.083,	2.94E+01,	7.69E+01,	8.77E+01,	62
5.167,	2.90E+01,	7.73E+01,	8.68E+01,	63
5.250,	2.86E+01,	7.77E+01,	8.59E+01,	63
5.333,	2.82E+01,	7.81E+01,	8.50E+01,	64
5.417,	2.79E+01,	7.85E+01,	8.42E+01,	64
5.500,	2.75E+01,	7.89E+01,	8.33E+01,	65
5.583,	2.72E+01,	7.93E+01,	8.25E+01,	65
5.667,	2.68E+01,	7.97E+01,	8.17E+01,	66
5.750,	2.65E+01,	8.01E+01,	8.09E+01,	66
5.833,	2.62E+01,	8.04E+01,	8.01E+01,	67
5.917,	2.59E+01,	8.08E+01,	7.94E+01,	67
6.000,	2.56E+01,	8.12E+01,	7.86E+01,	68
6.083,	2.53E+01,	8.15E+01,	7.79E+01,	68
6.167,	2.50E+01,	8.19E+01,	7.72E+01,	69
6.250,	2.47E+01,	8.22E+01,	7.65E+01,	69
6.333,	2.44E+01,	8.26E+01,	7.58E+01,	70
6.417,	2.42E+01,	8.29E+01,	7.52E+01,	70
6.500,	2.39E+01,	8.32E+01,	7.45E+01,	71
6.583,	2.37E+01,	8.36E+01,	7.39E+01,	71
6.667,	2.34E+01,	8.39E+01,	7.33E+01,	72
6.750,	2.32E+01,	8.42E+01,	7.27E+01,	72
6.833,	2.29E+01,	8.46E+01,	7.21E+01,	73
6.917,	2.27E+01,	8.49E+01,	7.15E+01,	73
7.000,	2.24E+01,	8.52E+01,	7.09E+01,	74
7.083,	2.22E+01,	8.55E+01,	7.03E+01,	74
7.167,	2.20E+01,	8.58E+01,	6.98E+01,	75
7.250,	2.18E+01,	8.61E+01,	6.92E+01,	75
7.333,	2.16E+01,	8.64E+01,	6.87E+01,	76
7.417,	2.14E+01,	8.67E+01,	6.82E+01,	76
7.500,	2.11E+01,	8.70E+01,	6.76E+01,	77

M 00-0002 R0
ATTACHMENT 12

RUN - TRC18 CHLORINE TRANS. ACCIDENT - 18 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:29:47

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	18.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                     =      Chlorine
Molecular Weight            (gm/mole) =       70.9
Heat of Vapor.                 (j/gm) =      288.0
Initial Boiling Point            (C) =      -34.1
Heat Capacity               (j/gm-C) =       .946
Specific Gravity                      =      1.570
Diffusion Coef.          (cm**2/sec) =       .079


MODEL PARAMETERS:
Puff Release Interval              (sec) =   10
Time Step                          (sec) =    5
Delay Between Release and Intake   (sec) =  300
Threshold Concentration            (ppm) =    2.84E-04
To convert ppm to g/m**3, multiply by        2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                 (ppm) =    7.46E+01
Exposure Two Minutes After Arrival  (g-sec/m**3) =    2.64E+01
Time From Plume Arrival to Max. Conc.       (sec) =   65.
Max. Conc. in Two Minutes After Arrival     (ppm) =    1.84E+02
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC18EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC18EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC18EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC18EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC18EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:29:47"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63,
.45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00,
444.89, 21029.15, 22726.03

.1667, 3, .00, .00, 648.58, .00, 24.67,
.43, 3.69, 42.88, .01, -34.10, 1035.00, 217.00,
444.89, 14869.85, 16566.74

.3333, 4, .00, .00, 628.73, .00, 19.85,
.41, 3.63, 41.31, .01, -34.10, 1035.00, 217.00,
444.89, 12141.18, 13838.07

.5000, 5, .00, .00, 611.75, .00, 16.98,
.40, 3.57, 40.05, .01, -34.10, 1035.00, 217.00,
444.89, 10514.57, 12211.46

.6667, 6, .00, .00, 596.73, .00, 15.02,
.39, 3.52, 38.97, .01, -34.10, 1035.00, 217.00,
444.89, 9404.52, 11101.41

.8333, 7, .00, .00, 583.16, .00, 13.57,
.38, 3.48, 38.01, .01, -34.10, 1035.00, 217.00,
444.89, 8585.11, 10282.00

1.0000, 8, .00, .00, 570.73, .00, 12.44,
.37, 3.44, 37.14, .01, -34.10, 1035.00, 217.00,
444.89, 7948.27, 9645.16

1.1667, 9, .00, .00, 559.20, .00, 11.53,
.36, 3.40, 36.35, .01, -34.10, 1035.00, 217.00,
444.89, 7434.93, 9131.81

1.3333, 10, .00, .00, 548.43, .00, 10.77,
.36, 3.37, 35.62, .01, -34.10, 1035.00, 217.00,
444.89, 7009.72, 8706.60

1.5000, 11, .00, .00, 538.31, .00, 10.12,
.35, 3.33, 34.93, .01, -34.10, 1035.00, 217.00,
444.89, 6650.00, 8346.89

1.6667, 12, .00, .00, 528.74, .00, 9.57,
.34, 3.30, 34.29, .01, -34.10, 1035.00, 217.00,
444.89, 6340.53, 8037.41

1.8333, 13, .00, .00, 519.66, .00, 9.08,
.34, 3.27, 33.68, .01, -34.10, 1035.00, 217.00,
444.89, 6070.59, 7767.48

2.0000, 14, .00, .00, 511.00, .00, 8.65,
.33, 3.25, 33.10, .01, -34.10, 1035.00, 217.00,
444.89, 5832.44, 7529.32

2.1667, 15, .00, .00, 502.73, .00, 8.27,
.33, 3.22, 32.55, .01, -34.10, 1035.00, 217.00,
444.89, 5620.28, 7317.16

2.3333, 16, .00, .00, 494.81, .00, 7.92,

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.32,       3.19,      32.02,       .01,     -34.10,    1035.00,     217.00,
444.89,    5429.70,    7126.59
    2.5000,   17,         .00,       .00,     487.20,        .00,       7.61,
.32,       3.17,      31.52,       .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,    6954.17
    2.6667,   18,         .00,       .00,     479.88,        .00,       7.32,
.31,       3.14,      31.03,       .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,    6797.20
    2.8333,   19,         .00,       .00,     472.81,        .00,       7.06,
.31,       3.12,      30.57,       .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,    6653.50
    3.0000,   20,         .00,       .00,     465.99,        .00,       6.82,
.30,       3.10,      30.12,       .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,    6521.30
    3.1667,   21,         .00,       .00,     459.40,        .00,       6.59,
.30,       3.07,      29.68,       .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,    6399.15
    3.3333,   22,         .00,       .00,     453.01,        .00,       6.39,
.29,       3.05,      29.26,       .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,    6285.82
    3.5000,   23,         .00,       .00,     446.82,        .00,       6.19,
.29,       3.03,      28.85,       .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,    6180.32
    3.6667,   24,         .00,       .00,     440.81,        .00,       6.01,
.28,       3.01,      28.46,       .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,    6081.77
    3.8333,   25,         .00,       .00,     434.97,        .00,       5.84,
.28,       2.99,      28.08,       .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,    5989.44
    4.0000,   26,         .00,       .00,     429.29,        .00,       5.68,
.28,       2.97,      27.71,       .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,    5902.72
    4.1667,   27,         .00,       .00,     423.77,        .00,       5.53,
.27,       2.95,      27.34,       .01,     -34.10,    1035.00,     217.00,
444.89,    4124.15,    5821.04
    4.3333,   28,         .00,       .00,     418.38,        .00,       5.38,
.27,       2.93,      26.99,       .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,    5743.95
    4.5000,   29,         .00,       .00,     413.14,        .00,       5.25,
.27,       2.91,      26.65,       .01,     -34.10,    1035.00,     217.00,
444.89,    3974.14,    5671.02
    4.6667,   30,         .00,       .00,     408.02,        .00,       5.12,
.26,       2.89,      26.31,       .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,    5601.90
    4.8333,   31,         .00,       .00,     403.02,        .00,       5.00,
.26,       2.88,      25.99,       .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,    5536.27
    5.0000,   32,         .00,       .00,     398.14,        .00,       4.88,
.26,       2.86,      25.67,       .01,     -34.10,    1035.00,     217.00,
444.89,    3776.95,    5473.83
    5.1667,   33,         .00,       .00,     393.38,        .00,       4.77,
.25,       2.84,      25.36,       .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,    5414.35
    5.3333,   34,         .00,       .00,     388.71,        .00,       4.66,
.25,       2.82,      25.06,       .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,    5357.59
    5.5000,   35,         .00,       .00,     384.16,        .00,       4.56,
.25,       2.81,      24.76,       .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,    5303.36
    5.6667,   36,         .00,       .00,     379.69,        .00,       4.46,
.24,       2.79,      24.47,       .01,     -34.10,    1035.00,     217.00,
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444.89,    3554.57,    5251.46
    5.8333,  37,          .00,        .00,     375.33,         .00,       4.37,
.24,         2.77,      24.18,         .01,    -34.10,     1035.00,     217.00,
444.89,    3504.86,    5201.74
    6.0000,  38,          .00,        .00,     371.05,         .00,       4.28,
.24,         2.76,      23.91,         .01,    -34.10,     1035.00,     217.00,
444.89,    3457.17,    5154.06
    6.1667,  39,          .00,        .00,     366.86,         .00,       4.19,
.24,         2.74,      23.63,         .01,    -34.10,     1035.00,     217.00,
444.89,    3411.38,    5108.26
    6.3333,  40,          .00,        .00,     362.75,         .00,       4.11,
.23,         2.73,      23.37,         .01,    -34.10,     1035.00,     217.00,
444.89,    3367.36,    5064.25
    6.5000,  41,          .00,        .00,     358.72,         .00,       4.03,
.23,         2.71,      23.10,         .01,    -34.10,     1035.00,     217.00,
444.89,    3325.00,    5021.89
    6.6667,  42,          .00,        .00,     354.77,         .00,       3.95,
.23,         2.70,      22.85,         .01,    -34.10,     1035.00,     217.00,
444.89,    3284.20,    4981.09
    6.8333,  43,          .00,        .00,     350.89,         .00,       3.88,
.23,         2.68,      22.60,         .01,    -34.10,     1035.00,     217.00,
444.89,    3244.87,    4941.75
    7.0000,  44,          .00,        .00,     347.08,         .00,       3.81,
.22,         2.67,      22.35,         .01,    -34.10,     1035.00,     217.00,
444.89,    3206.91,    4903.80
    7.1667,  45,          .00,        .00,     343.35,         .00,       3.74,
.22,         2.65,      22.11,         .01,    -34.10,     1035.00,     217.00,
444.89,    3170.26,    4867.15
    7.3333,  46,          .00,        .00,     339.68,         .00,       3.67,
.22,         2.64,      21.87,         .01,    -34.10,     1035.00,     217.00,
444.89,    3134.84,    4831.73
    7.5000,  47,          .00,        .00,     336.07,         .00,       3.60,
.22,         2.62,      21.64,         .01,    -34.10,     1035.00,     217.00,
444.89,    3100.58,    4797.47
    7.6667,  48,          .00,        .00,     332.53,         .00,       3.54,
.21,         2.61,      21.41,         .01,    -34.10,     1035.00,     217.00,
444.89,    3067.42,    4764.30
    7.8333,  49,          .00,        .00,     329.05,         .00,       3.48,
.21,         2.60,      21.18,         .01,    -34.10,     1035.00,     217.00,
444.89,    3035.30,    4732.18
    8.0000,  50,          .00,        .00,     325.63,         .00,       3.42,
.21,         2.58,      20.96,         .01,    -34.10,     1035.00,     217.00,
444.89,    3004.16,    4701.05
    8.1667,  51,          .00,        .00,     322.27,         .00,       3.36,
.21,         2.57,      20.74,         .01,    -34.10,     1035.00,     217.00,
444.89,    2973.97,    4670.86
    8.3333,  52,          .00,        .00,     318.96,         .00,       3.31,
.21,         2.56,      20.53,         .01,    -34.10,     1035.00,     217.00,
444.89,    2944.67,    4641.56
    8.5000,  53,          .00,        .00,     315.71,         .00,       3.25,
.20,         2.54,      20.32,         .01,    -34.10,     1035.00,     217.00,
444.89,    2916.22,    4613.10
    8.6667,  54,          .00,        .00,     312.50,         .00,       3.20,
.20,         2.53,      20.11,         .01,    -34.10,     1035.00,     217.00,
444.89,    2888.58,    4585.46
    8.8333,  55,          .00,        .00,     309.35,         .00,       3.15,
.20,         2.52,      19.90,         .01,    -34.10,     1035.00,     217.00,
444.89,    2861.70,    4558.59
    9.0000,  56,          .00,        .00,     306.25,         .00,       3.10,
.20,         2.50,      19.70,         .01,    -34.10,     1035.00,     217.00,
444.89,    2835.57,    4532.46
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    9.1667,  57,       .00,       .00,    303.20,       .00,      3.05,
.20,       2.49,     19.51,       .01,    -34.10,   1035.00,    217.00,
444.89,    2810.14,   4507.02
    9.3333,  58,       .00,       .00,    300.19,       .00,      3.01,
.19,       2.48,     19.31,       .01,    -34.10,   1035.00,    217.00,
444.89,    2785.38,   4482.27
    9.5000,  59,       .00,       .00,    297.23,       .00,      2.96,
.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
444.89,    2761.26,   4458.15
    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
    9.8333,  61,       .00,       .00,    291.45,       .00,      2.87,
.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
   10.6667,  66,       .00,       .00,    277.71,       .00,      2.67,
.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
   12.1667,  75,       .00,       .00,    255.27,       .00,      2.36,
.16,       2.29,     16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,     16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
```

.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:29:47"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	2.69E-02,	3.81E-04,	2.69E-02,	32
.083,	1.22E-01,	2.11E-03,	7.47E-02,	32
.167,	4.59E-01,	8.60E-03,	2.03E-01,	33
.250,	1.47E+00,	2.94E-02,	5.20E-01,	33
.333,	4.06E+00,	8.68E-02,	1.23E+00,	34
.417,	9.75E+00,	2.25E-01,	2.65E+00,	34
.500,	2.05E+01,	5.15E-01,	5.20E+00,	35
.583,	3.83E+01,	1.06E+00,	9.33E+00,	35
.667,	6.36E+01,	1.95E+00,	1.54E+01,	36
.750,	9.48E+01,	3.29E+00,	2.33E+01,	36
.833,	1.28E+02,	5.10E+00,	3.28E+01,	37
.917,	1.57E+02,	7.32E+00,	4.32E+01,	37
1.000,	1.77E+02,	9.83E+00,	5.35E+01,	38
1.083,	1.84E+02, MAX	1.24E+01,	6.28E+01,	38
1.167,	1.79E+02,	1.50E+01,	7.05E+01,	39
1.250,	1.63E+02,	1.73E+01,	7.63E+01,	39
1.333,	1.40E+02,	1.92E+01,	8.01E+01,	40
1.417,	1.16E+02,	2.09E+01,	8.21E+01,	40
1.500,	9.36E+01,	2.22E+01,	8.27E+01,	41
1.583,	7.46E+01,	2.33E+01,	8.23E+01,	41
1.667,	5.99E+01,	2.41E+01,	8.12E+01,	42
1.750,	4.91E+01,	2.48E+01,	7.97E+01,	42
1.833,	4.16E+01,	2.54E+01,	7.81E+01,	43
1.917,	3.64E+01,	2.59E+01,	7.63E+01,	43
2.000,	3.29E+01,	2.64E+01,	7.46E+01,	44
2.083,	3.05E+01,	2.68E+01,	7.29E+01,	44
2.167,	2.87E+01,	2.72E+01,	7.13E+01,	45
2.250,	2.73E+01,	2.76E+01,	6.97E+01,	45
2.333,	2.62E+01,	2.80E+01,	6.82E+01,	46
2.417,	2.52E+01,	2.83E+01,	6.68E+01,	46
2.500,	2.44E+01,	2.87E+01,	6.54E+01,	47
2.583,	2.36E+01,	2.90E+01,	6.41E+01,	47
2.667,	2.29E+01,	2.93E+01,	6.28E+01,	48
2.750,	2.23E+01,	2.96E+01,	6.17E+01,	48
2.833,	2.17E+01,	2.99E+01,	6.05E+01,	49
2.917,	2.11E+01,	3.02E+01,	5.94E+01,	49
3.000,	2.06E+01,	3.05E+01,	5.84E+01,	50
3.083,	2.01E+01,	3.08E+01,	5.74E+01,	50
3.167,	1.96E+01,	3.11E+01,	5.64E+01,	51
3.250,	1.92E+01,	3.14E+01,	5.55E+01,	51
3.333,	1.88E+01,	3.16E+01,	5.46E+01,	52
3.417,	1.84E+01,	3.19E+01,	5.37E+01,	52
3.500,	1.80E+01,	3.21E+01,	5.29E+01,	53
3.583,	1.77E+01,	3.24E+01,	5.21E+01,	53
3.667,	1.73E+01,	3.26E+01,	5.13E+01,	54
3.750,	1.70E+01,	3.29E+01,	5.06E+01,	54

3.833,	1.67E+01,	3.31E+01,	4.98E+01,	55
3.917,	1.64E+01,	3.33E+01,	4.91E+01,	55
4.000,	1.61E+01,	3.36E+01,	4.85E+01,	56
4.083,	1.58E+01,	3.38E+01,	4.78E+01,	56
4.167,	1.56E+01,	3.40E+01,	4.72E+01,	57
4.250,	1.53E+01,	3.42E+01,	4.66E+01,	57
4.333,	1.51E+01,	3.44E+01,	4.60E+01,	58
4.417,	1.48E+01,	3.47E+01,	4.54E+01,	58
4.500,	1.46E+01,	3.49E+01,	4.48E+01,	59
4.583,	1.44E+01,	3.51E+01,	4.43E+01,	59
4.667,	1.42E+01,	3.53E+01,	4.38E+01,	60
4.750,	1.40E+01,	3.55E+01,	4.32E+01,	60
4.833,	1.38E+01,	3.57E+01,	4.27E+01,	61
4.917,	1.36E+01,	3.59E+01,	4.23E+01,	61
5.000,	1.34E+01,	3.60E+01,	4.18E+01,	62
5.083,	1.32E+01,	3.62E+01,	4.13E+01,	62
5.167,	1.30E+01,	3.64E+01,	4.09E+01,	63
5.250,	1.28E+01,	3.66E+01,	4.04E+01,	63
5.333,	1.27E+01,	3.68E+01,	4.00E+01,	64
5.417,	1.25E+01,	3.69E+01,	3.96E+01,	64
5.500,	1.24E+01,	3.71E+01,	3.92E+01,	65
5.583,	1.22E+01,	3.73E+01,	3.88E+01,	65
5.667,	1.20E+01,	3.75E+01,	3.84E+01,	66
5.750,	1.19E+01,	3.76E+01,	3.80E+01,	66
5.833,	1.18E+01,	3.78E+01,	3.77E+01,	67
5.917,	1.16E+01,	3.80E+01,	3.73E+01,	67
6.000,	1.15E+01,	3.81E+01,	3.69E+01,	68
6.083,	1.14E+01,	3.83E+01,	3.66E+01,	68
6.167,	1.12E+01,	3.84E+01,	3.63E+01,	69
6.250,	1.11E+01,	3.86E+01,	3.59E+01,	69
6.333,	1.10E+01,	3.88E+01,	3.56E+01,	70
6.417,	1.09E+01,	3.89E+01,	3.53E+01,	70
6.500,	1.07E+01,	3.91E+01,	3.50E+01,	71
6.583,	1.06E+01,	3.92E+01,	3.47E+01,	71
6.667,	1.05E+01,	3.94E+01,	3.44E+01,	72
6.750,	1.04E+01,	3.95E+01,	3.41E+01,	72
6.833,	1.03E+01,	3.97E+01,	3.38E+01,	73
6.917,	1.02E+01,	3.98E+01,	3.35E+01,	73
7.000,	1.01E+01,	3.99E+01,	3.32E+01,	74
7.083,	9.97E+00,	4.01E+01,	3.30E+01,	74
7.167,	9.87E+00,	4.02E+01,	3.27E+01,	75
7.250,	9.77E+00,	4.04E+01,	3.24E+01,	75
7.333,	9.68E+00,	4.05E+01,	3.22E+01,	76
7.417,	9.58E+00,	4.06E+01,	3.19E+01,	76
7.500,	9.49E+00,	4.08E+01,	3.17E+01,	77

M-00-0002 R0
ATTACHMENT 13

RUN - TRCER - CHLORINE TRANS. ACCIDENT - 20.8 METER RECEPTOR

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating Concentrations Of Toxic Substances At Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:30:30

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	20.8
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	2.60E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	2.33E+01
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	8.23E+00
Time From Plume Arrival to Max. Conc.	(sec)	=	65.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	5.83E+01

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRCEREX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRCEREX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRCEREX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRCEREX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRCEREX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:30:30"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

.1667, 3, .00, .00, 648.58, .00, 24.67, .43, 3.69, 42.88, .01, -34.10, 1035.00, 217.00, 444.89, 14869.85, 16566.74

.3333, 4, .00, .00, 628.73, .00, 19.85, .41, 3.63, 41.31, .01, -34.10, 1035.00, 217.00, 444.89, 12141.18, 13838.07

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.32,        3.17,       31.52,        .01,     -34.10,    1035.00,     217.00,
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444.89,    5100.32,     6797.20
    2.8333,  19,          .00,        .00,     472.81,         .00,        7.06,
.31,        3.12,       30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,     6653.50
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.30,        3.10,       30.12,        .01,     -34.10,    1035.00,     217.00,
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    3.3333,  22,          .00,        .00,     453.01,         .00,        6.39,
.29,        3.05,       29.26,        .01,     -34.10,    1035.00,     217.00,
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    3.5000,  23,          .00,        .00,     446.82,         .00,        6.19,
.29,        3.03,       28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
    3.6667,  24,          .00,        .00,     440.81,         .00,        6.01,
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    4.0000,  26,          .00,        .00,     429.29,         .00,        5.68,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:30:30"

"TIME", "(min)"	"CONCENTRATION" "(ppm)"	"EXPOSURE", "(g-sec/m**3)"	"MEAN CONC.", "(ppm)"	"NUM OF PUFFS"
.000,	6.27E-03,	8.86E-05,	6.27E-03,	32
.083,	2.92E-02,	5.02E-04,	1.78E-02,	32
.167,	1.13E-01,	2.10E-03,	4.95E-02,	33
.250,	3.72E-01,	7.36E-03,	1.30E-01,	33
.333,	1.06E+00,	2.23E-02,	3.15E-01,	34
.417,	2.60E+00,	5.90E-02,	6.96E-01,	34
.500,	5.62E+00,	1.38E-01,	1.40E+00,	35
.583,	1.07E+01,	2.90E-01,	2.56E+00,	35
.667,	1.82E+01,	5.48E-01,	4.31E+00,	36
.750,	2.78E+01,	9.41E-01,	6.65E+00,	36
.833,	3.83E+01,	1.48E+00,	9.53E+00,	37
.917,	4.80E+01,	2.16E+00,	1.27E+01,	37
1.000,	5.51E+01,	2.94E+00,	1.60E+01,	38
1.083,	5.83E+01, MAX	3.76E+00,	1.90E+01,	38
1.167,	5.73E+01,	4.57E+00,	2.16E+01,	39
1.250,	5.27E+01,	5.32E+00,	2.35E+01,	39
1.333,	4.58E+01,	5.97E+00,	2.48E+01,	40
1.417,	3.80E+01,	6.50E+00,	2.56E+01,	40
1.500,	3.05E+01,	6.94E+00,	2.58E+01,	41
1.583,	2.41E+01,	7.28E+00,	2.57E+01,	41
1.667,	1.90E+01,	7.55E+00,	2.54E+01,	42
1.750,	1.52E+01,	7.76E+00,	2.49E+01,	42
1.833,	1.26E+01,	7.94E+00,	2.44E+01,	43
1.917,	1.08E+01,	8.09E+00,	2.38E+01,	43
2.000,	9.57E+00,	8.23E+00,	2.33E+01,	44
2.083,	8.75E+00,	8.35E+00,	2.27E+01,	44
2.167,	8.17E+00,	8.47E+00,	2.22E+01,	45
2.250,	7.74E+00,	8.57E+00,	2.17E+01,	45
2.333,	7.40E+00,	8.68E+00,	2.12E+01,	46
2.417,	7.12E+00,	8.78E+00,	2.07E+01,	46
2.500,	6.87E+00,	8.88E+00,	2.03E+01,	47
2.583,	6.64E+00,	8.97E+00,	1.98E+01,	47
2.667,	6.45E+00,	9.06E+00,	1.94E+01,	48
2.750,	6.26E+00,	9.15E+00,	1.90E+01,	48
2.833,	6.09E+00,	9.24E+00,	1.87E+01,	49
2.917,	5.93E+00,	9.32E+00,	1.83E+01,	49
3.000,	5.78E+00,	9.40E+00,	1.80E+01,	50
3.083,	5.65E+00,	9.48E+00,	1.76E+01,	50
3.167,	5.51E+00,	9.56E+00,	1.73E+01,	51
3.250,	5.39E+00,	9.64E+00,	1.70E+01,	51
3.333,	5.27E+00,	9.71E+00,	1.68E+01,	52
3.417,	5.16E+00,	9.78E+00,	1.65E+01,	52
3.500,	5.05E+00,	9.86E+00,	1.62E+01,	53
3.583,	4.95E+00,	9.93E+00,	1.60E+01,	53
3.667,	4.86E+00,	9.99E+00,	1.57E+01,	54
3.750,	4.76E+00,	1.01E+01,	1.55E+01,	54

M00 0002 RD
ATT 13 Pg 8

3.833,	4.68E+00,	1.01E+01,	1.52E+01,	55
3.917,	4.59E+00,	1.02E+01,	1.50E+01,	55
4.000,	4.51E+00,	1.03E+01,	1.48E+01,	56
4.083,	4.43E+00,	1.03E+01,	1.46E+01,	56
4.167,	4.36E+00,	1.04E+01,	1.44E+01,	57
4.250,	4.29E+00,	1.04E+01,	1.42E+01,	57
4.333,	4.22E+00,	1.05E+01,	1.40E+01,	58
4.417,	4.15E+00,	1.06E+01,	1.38E+01,	58
4.500,	4.09E+00,	1.06E+01,	1.37E+01,	59
4.583,	4.03E+00,	1.07E+01,	1.35E+01,	59
4.667,	3.97E+00,	1.07E+01,	1.33E+01,	60
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5.250,	3.59E+00,	1.11E+01,	1.23E+01,	63
5.333,	3.55E+00,	1.12E+01,	1.21E+01,	64
5.417,	3.50E+00,	1.12E+01,	1.20E+01,	64
5.500,	3.46E+00,	1.13E+01,	1.19E+01,	65
5.583,	3.41E+00,	1.13E+01,	1.18E+01,	65
5.667,	3.37E+00,	1.13E+01,	1.16E+01,	66
5.750,	3.33E+00,	1.14E+01,	1.15E+01,	66
5.833,	3.29E+00,	1.14E+01,	1.14E+01,	67
5.917,	3.25E+00,	1.15E+01,	1.13E+01,	67
6.000,	3.21E+00,	1.15E+01,	1.12E+01,	68
6.083,	3.18E+00,	1.16E+01,	1.11E+01,	68
6.167,	3.14E+00,	1.16E+01,	1.10E+01,	69
6.250,	3.10E+00,	1.17E+01,	1.09E+01,	69
6.333,	3.07E+00,	1.17E+01,	1.08E+01,	70
6.417,	3.04E+00,	1.18E+01,	1.07E+01,	70
6.500,	3.00E+00,	1.18E+01,	1.06E+01,	71
6.583,	2.97E+00,	1.18E+01,	1.05E+01,	71
6.667,	2.94E+00,	1.19E+01,	1.04E+01,	72
6.750,	2.91E+00,	1.19E+01,	1.03E+01,	72
6.833,	2.88E+00,	1.20E+01,	1.02E+01,	73
6.917,	2.85E+00,	1.20E+01,	1.01E+01,	73
7.000,	2.82E+00,	1.20E+01,	1.00E+01,	74
7.083,	2.79E+00,	1.21E+01,	9.93E+00,	74
7.167,	2.76E+00,	1.21E+01,	9.85E+00,	75
7.250,	2.73E+00,	1.22E+01,	9.77E+00,	75
7.333,	2.71E+00,	1.22E+01,	9.69E+00,	76
7.417,	2.68E+00,	1.22E+01,	9.61E+00,	76
7.500,	2.65E+00,	1.23E+01,	9.54E+00,	77

RUN TRC08 - CHLORINE TRANS ACCIDENT - NO ISOLATION

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:27:04

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	8.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

M00-0002 R0
ATT 14- Pg 2

Ground Temperature (C) = 32.4

EFFLUENT CHARACTERISTICS:

Material Released		=	Chlorine
Molecular Weight	(gm/mole)	=	70.9
Heat of Vapor.	(j/gm)	=	288.0
Initial Boiling Point	(C)	=	-34.1
Heat Capacity	(j/gm-C)	=	.946
Specific Gravity		=	1.570
Diffusion Coef.	(cm**2/sec)	=	.079

MODEL PARAMETERS:

Puff Release Interval	(sec)	=	10
Time Step	(sec)	=	5
Delay Between Release and Intake	(sec)	=	300
Threshold Concentration	(ppm)	=	3.49E-04
To convert ppm to g/m**3, multiply by			2.83E-03

RESULTS:

Average Concentration During First Two Minutes After Arrival of Plume	(ppm)	=	1.28E+03
Exposure Two Minutes After Arrival	(g-sec/m**3)	=	4.52E+02
Time From Plume Arrival to Max. Conc.	(sec)	=	65.
Max. Conc. in Two Minutes After Arrival	(ppm)	=	3.00E+03

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:27:04"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

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2.3333, 16, .00, .00, 494.81, .00, 7.92,

M00-0002 R0
ATT 14 · Pg 4

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444.89,    5429.70,     7126.59
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.32,        3.17,       31.52,        .01,      -34.10,    1035.00,     217.00,
444.89,    5257.29,     6954.17
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.31,        3.14,       31.03,        .01,      -34.10,    1035.00,     217.00,
444.89,    5100.32,     6797.20
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.31,        3.12,       30.57,        .01,      -34.10,    1035.00,     217.00,
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.30,        3.10,       30.12,        .01,      -34.10,    1035.00,     217.00,
444.89,    4824.42,     6521.30
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.29,        3.03,       28.85,        .01,      -34.10,    1035.00,     217.00,
444.89,    4483.43,     6180.32
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.28,        3.01,       28.46,        .01,      -34.10,    1035.00,     217.00,
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.28,        2.97,       27.71,        .01,      -34.10,    1035.00,     217.00,
444.89,    4205.83,     5902.72
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444.89,    3974.14,     5671.02
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.24,         2.74,       23.63,        .01,    -34.10,     1035.00,    217.00,
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444.89,    2944.67,    4641.56
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.20,         2.54,       20.32,        .01,    -34.10,     1035.00,    217.00,
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.20,         2.53,       20.11,        .01,    -34.10,     1035.00,    217.00,
444.89,    2888.58,    4585.46
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444.89,    2861.70,    4558.59
    9.0000,  56,          .00,        .00,     306.25,         .00,      3.10,
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444.89,    2835.57,    4532.46
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444.89,    2628.64,  4325.53
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.18,       2.38,    17.86,      .01,    -34.10,  1035.00,   217.00,
444.89,    2608.34,  4305.23
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.18,       2.37,    17.69,      .01,    -34.10,  1035.00,   217.00,
444.89,    2588.51,  4285.40
   11.0000,  68,      .00,      .00,    272.48,      .00,     2.60,
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444.89,    2569.12,  4266.01
   11.1667,  69,      .00,      .00,    269.92,      .00,     2.56,
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444.89,    2550.16,  4247.05
   11.3333,  70,      .00,      .00,    267.39,      .00,     2.52,
.17,       2.34,    17.19,      .01,    -34.10,  1035.00,   217.00,
444.89,    2531.61,  4228.50
   11.5000,  71,      .00,      .00,    264.90,      .00,     2.49,
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444.89,    2513.46,  4210.35
   11.6667,  72,      .00,      .00,    262.45,      .00,     2.46,
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   12.1667,  75,      .00,      .00,    255.27,      .00,     2.36,
.16,       2.29,    16.41,      .01,    -34.10,  1035.00,   217.00,
444.89,    2444.59,  4141.48
   12.3333,  76,      .00,      .00,    252.95,      .00,     2.33,
.16,       2.27,    16.26,      .01,    -34.10,  1035.00,   217.00,
444.89,    2428.24,  4125.12
   12.5000,  77,      .00,      .00,    250.65,      .00,     2.30,
```

.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"

"HABIT release design specification file 14:10:53 11-15-1999
"

"
"Run on 2/17/2000 at 08:27:04"

"TIME",	"CONCENTRATION"	"EXPOSURE",	"MEAN CONC.",	"NUM OF PUFFS"
"(min)",	"(ppm)",	"(g-sec/m**3)",	"(ppm)"	
.000,	8.81E-01,	1.25E-02,	8.81E-01,	32
.083,	3.81E+00,	6.63E-02,	2.34E+00,	32
.167,	1.33E+01,	2.54E-01,	6.00E+00,	33
.250,	4.00E+01,	8.20E-01,	1.45E+01,	33
.333,	1.04E+02,	2.28E+00,	3.23E+01,	34
.417,	2.34E+02,	5.59E+00,	6.59E+01,	34
.500,	4.65E+02,	1.22E+01,	1.23E+02,	35
.583,	8.19E+02,	2.37E+01,	2.10E+02,	35
.667,	1.29E+03,	4.20E+01,	3.30E+02,	36
.750,	1.83E+03,	6.78E+01,	4.79E+02,	36
.833,	2.35E+03,	1.01E+02,	6.49E+02,	37
.917,	2.76E+03,	1.40E+02,	8.25E+02,	37
1.000,	2.98E+03,	1.82E+02,	9.91E+02,	38
1.083,	3.00E+03,	2.25E+02,	1.13E+03,	38
1.167,	2.83E+03,	2.65E+02,	1.25E+03,	39
1.250,	2.52E+03,	3.00E+02,	1.33E+03,	39
1.333,	2.16E+03,	3.31E+02,	1.38E+03,	40
1.417,	1.80E+03,	3.56E+02,	1.40E+03,	40
1.500,	1.48E+03,	3.77E+02,	1.40E+03,	41
1.583,	1.22E+03,	3.94E+02,	1.39E+03,	41
1.667,	1.03E+03,	4.09E+02,	1.38E+03,	42
1.750,	8.89E+02,	4.21E+02,	1.36E+03,	42
1.833,	7.90E+02,	4.33E+02,	1.33E+03,	43
1.917,	7.21E+02,	4.43E+02,	1.31E+03,	43
2.000,	6.71E+02,	4.52E+02,	1.28E+03,	44
2.083,	6.33E+02,	4.61E+02,	1.25E+03,	44
2.167,	6.03E+02,	4.70E+02,	1.23E+03,	45
2.250,	5.78E+02,	4.78E+02,	1.21E+03,	45
2.333,	5.57E+02,	4.86E+02,	1.18E+03,	46
2.417,	5.38E+02,	4.93E+02,	1.16E+03,	46
2.500,	5.21E+02,	5.01E+02,	1.14E+03,	47
2.583,	5.06E+02,	5.08E+02,	1.12E+03,	47
2.667,	4.91E+02,	5.15E+02,	1.10E+03,	48
2.750,	4.78E+02,	5.22E+02,	1.09E+03,	48
2.833,	4.65E+02,	5.28E+02,	1.07E+03,	49
2.917,	4.54E+02,	5.35E+02,	1.05E+03,	49
3.000,	4.43E+02,	5.41E+02,	1.03E+03,	50
3.083,	4.33E+02,	5.47E+02,	1.02E+03,	50
3.167,	4.23E+02,	5.53E+02,	1.00E+03,	51
3.250,	4.14E+02,	5.59E+02,	9.88E+02,	51
3.333,	4.05E+02,	5.65E+02,	9.74E+02,	52
3.417,	3.97E+02,	5.70E+02,	9.60E+02,	52
3.500,	3.89E+02,	5.76E+02,	9.47E+02,	53
3.583,	3.81E+02,	5.81E+02,	9.34E+02,	53
3.667,	3.74E+02,	5.86E+02,	9.22E+02,	54
3.750,	3.67E+02,	5.92E+02,	9.10E+02,	54

3.833,	3.60E+02,	5.97E+02,	8.98E+02,	55
3.917,	3.54E+02,	6.02E+02,	8.87E+02,	55
4.000,	3.48E+02,	6.07E+02,	8.76E+02,	56
4.083,	3.42E+02,	6.11E+02,	8.65E+02,	56
4.167,	3.37E+02,	6.16E+02,	8.55E+02,	57
4.250,	3.31E+02,	6.21E+02,	8.44E+02,	57
4.333,	3.26E+02,	6.25E+02,	8.35E+02,	58
4.417,	3.21E+02,	6.30E+02,	8.25E+02,	58
4.500,	3.16E+02,	6.35E+02,	8.16E+02,	59
4.583,	3.11E+02,	6.39E+02,	8.07E+02,	59
4.667,	3.07E+02,	6.43E+02,	7.98E+02,	60
4.750,	3.02E+02,	6.48E+02,	7.90E+02,	60
4.833,	2.98E+02,	6.52E+02,	7.81E+02,	61
4.917,	2.94E+02,	6.56E+02,	7.73E+02,	61
5.000,	2.90E+02,	6.60E+02,	7.65E+02,	62
5.083,	2.86E+02,	6.64E+02,	7.57E+02,	62
5.167,	2.82E+02,	6.68E+02,	7.50E+02,	63
5.250,	2.79E+02,	6.72E+02,	7.43E+02,	63
5.333,	2.75E+02,	6.76E+02,	7.35E+02,	64
5.417,	2.71E+02,	6.80E+02,	7.28E+02,	64
5.500,	2.68E+02,	6.83E+02,	7.21E+02,	65
5.583,	2.65E+02,	6.87E+02,	7.15E+02,	65
5.667,	2.62E+02,	6.91E+02,	7.08E+02,	66
5.750,	2.58E+02,	6.95E+02,	7.02E+02,	66
5.833,	2.55E+02,	6.98E+02,	6.95E+02,	67
5.917,	2.52E+02,	7.02E+02,	6.89E+02,	67
6.000,	2.49E+02,	7.05E+02,	6.83E+02,	68
6.083,	2.47E+02,	7.09E+02,	6.77E+02,	68
6.167,	2.44E+02,	7.12E+02,	6.72E+02,	69
6.250,	2.41E+02,	7.16E+02,	6.66E+02,	69
6.333,	2.38E+02,	7.19E+02,	6.60E+02,	70
6.417,	2.36E+02,	7.22E+02,	6.55E+02,	70
6.500,	2.33E+02,	7.26E+02,	6.50E+02,	71
6.583,	2.31E+02,	7.29E+02,	6.44E+02,	71
6.667,	2.28E+02,	7.32E+02,	6.39E+02,	72
6.750,	2.26E+02,	7.35E+02,	6.34E+02,	72
6.833,	2.24E+02,	7.38E+02,	6.29E+02,	73
6.917,	2.21E+02,	7.42E+02,	6.24E+02,	73
7.000,	2.19E+02,	7.45E+02,	6.20E+02,	74
7.083,	2.17E+02,	7.48E+02,	6.15E+02,	74
7.167,	2.15E+02,	7.51E+02,	6.10E+02,	75
7.250,	2.13E+02,	7.54E+02,	6.06E+02,	75
7.333,	2.10E+02,	7.57E+02,	6.01E+02,	76
7.417,	2.08E+02,	7.60E+02,	5.97E+02,	76
7.500,	2.06E+02,	7.63E+02,	5.93E+02,	77

```
CHEM release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

STARTDATA:
          2           4           0      !Distance units & Flow Units used in
input, X/Q option flag
       -00.0      !Power level (MWt)
    10333.44      !Control room volume (m3)
       -00.0       -00.0       -00.0      !Core fractions:  Halogens (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Nobles (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Solids (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Sodiums (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Plutoniums (Elem.,
Org., Part.)
           0           1      !====== Start of step  1,  StartTime (hrs),
EndTime (hrs)
           0      !Effluent Vertical velocity m/s
           0      !Effluent flow rate (m3/s)
           0      !Release height (m)
           0      !Building height (m)
           0      !Building cross sectional Area (m2)
           0      !Horizontal Distance to receptor (m)
           0      !Air intake height (m)
           0      !Windspeed (m/s)
           4      !Vertical dispersion class
           4      !Horizontal dispersion class
      2.6901      !Flow rate from unfiltered intake source #1 (m3/s)
           0      !Flow rate from unfiltered intake source #2 (m3/s)
           0      !Bottled air flow rate (m3/s)
           0      !Flow rate from filtered intake source #1 (m3/s)
           0           0           0      !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
           0      !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
           0           0           0      !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
           0      !Recirculation flow rate (m3/s)
           0           0           0      !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
           1      !Control room occupancy factor
           1           1      !====== Start of step  2,  StartTime (hrs),
EndTime (hrs)
           0      !Effluent Vertical velocity m/s
           0      !Effluent flow rate (m3/s)
           0      !Release height (m)
           0      !Building height (m)
           0      !Building cross sectional Area (m2)
           0      !Horizontal Distance to receptor (m)
           0      !Air intake height (m)
           0      !Windspeed (m/s)
           4      !Vertical dispersion class
           4      !Horizontal dispersion class
      2.6901      !Flow rate from unfiltered intake source #1 (m3/s)
           0      !Flow rate from unfiltered intake source #2 (m3/s)
           0      !Bottled air flow rate (m3/s)
```

```
           0      !Flow rate from filtered intake source #1 (m3/s)
           0           0           0      !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
           0      !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
           0           0           0      !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
           0      !Recirculation flow rate (m3/s)
           0           0           0      !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
           1      !Control room occupancy factor
```

M 00-0002 ICD
ATT 14- Pg 11

"C H E M C O D E"

"Control room flow file: C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08CB.INP
!CONHAB-CHEM
 flow d"
"CHEM release. Used by CHEM and CONHAB."
"HABIT release design specification file 14:10:53 11-15-1999"
" "
"CONTROL ROOM VOLUME = ","   10333.440000"" (m**3)"
"EXTRAN File: C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08EX.CNX !EXTRAN output
chro"
"EXTRAN Concentration and exposure chronology output"
" "
"EXTRAN release. Used by CHEM and CONHAB."
"HABIT release design specification file 14:10:53 11-15-1999"
" "
" "
"Run on 2/17/2000 at 08:27:04"
"UNITS: (ppm)   (g-sec/m**3) 2.8278E-03"
"TIME   CONCENTRATION   EXPOSURE   MEAN CONC.   NUM OF PUFFS"
"(min)   (ppm)   (g-sec/m**3)   (ppm)"
"CHEM output table: C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08CH.TAB !CHEM
table output
"
"Spreadsheet output file:: C:\HABIT\HAB_DEMO\DEMO1\REV1\TRC08CH.SPD
!CHEM outp
 ut file f"

"TIME", "min",	"CONCENTRATION", "(ppm)",	"EXPOSURE", "(g-sec/m**3)",	"MEAN CONC" "(ppm)"
.000,	.00114142,	.00001607,	.00114142
.083,	.00613560,	.00010352,	.00365347
.167,	.02335915,	.00043247,	.01019575
.250,	.07515293,	.00149081,	.02638628
.333,	.21141930,	.00450398,	.06365912
.417,	.51431600,	.01174681,	.13846820
.500,	1.11610400,	.02746428,	.27765130
.583,	2.18851400,	.05865524,	.51829980
NASAL DETECTION → .667,	3.85700400,	.11297130,	.88778310
.750,	6.22295700,	.20060570,	1.41937900
.833,	9.29612000,	.33309510,	2.14091300
.917,	12.85993000,	.51419440,	3.03059100
1.000,	16.70416000,	.74942960,	4.07851900
1.083,	20.61587000,	1.04325000,	5.26886900
1.167,	24.25571000,	1.38482900,	6.52959400
1.250,	27.48919000,	1.77194400,	7.83465500
1.333,	30.28535000,	2.20357500,	9.16553800
1.417,	32.57819000,	2.66235500,	10.46104000
1.500,	34.45347000,	3.14754400,	11.71901000
1.583,	36.00796000,	3.66073400,	12.94293000
1.667,	37.29578000,	4.18594900,	14.09795000
1.750,	38.39925000,	4.72670400,	15.19833000
1.833,	39.38475000,	5.28802100,	16.25815000
1.917,	40.26785000,	5.85509100,	17.25455000
2.000,	41.08503000,	6.43366800,	18.20411000
2.083,	41.86115000,	7.03027800,	19.12113000
2.167,	42.58816000,	7.63002300,	19.98680000
2.250,	43.28184000,	8.23953700,	20.81556000

NASAL DETECTION → + 2 MIN

2.333,	43.95543000,	8.86599500,	21.61976000
2.417,	44.59551000,	9.49400900,	22.38256000
2.500,	45.21274000,	10.13071000,	23.11616000
2.583,	45.81693000,	10.78370000,	23.83115000
2.667,	46.39370000,	11.43704000,	24.51213000
2.750,	46.95289000,	12.09825000,	25.16959000
2.833,	47.50104000,	12.77524000,	25.81266000
2.917,	48.02770000,	13.45159000,	26.42728000
3.000,	48.53942000,	14.13514000,	27.02258000
3.083,	49.04353000,	14.83412000,	27.60665000
3.167,	49.52803000,	15.53159000,	28.16649000
3.250,	50.00024000,	16.23572000,	28.71020000
3.333,	50.46571000,	16.95496000,	29.24502000
3.417,	50.91468000,	17.67196000,	29.75890000
3.500,	51.35271000,	18.39514000,	30.25912000
3.583,	51.78494000,	19.13318000,	30.75221000
3.667,	52.20240000,	19.86832000,	31.22697000
3.750,	52.61026000,	20.60920000,	31.69001000
3.833,	53.01331000,	21.36475000,	32.14729000
3.917,	53.40326000,	22.11680000,	32.58835000
4.000,	53.78494000,	22.87423000,	33.01924000
4.083,	54.16285000,	23.64616000,	33.44546000
4.167,	54.52929000,	24.41407000,	33.85722000
4.250,	54.88749000,	25.18702000,	34.26006000
4.333,	55.24297000,	25.97434000,	34.65910000
4.417,	55.58728000,	26.75715000,	35.04510000
4.500,	55.92467000,	27.54471000,	35.42324000
4.583,	56.25913000,	28.34652000,	35.79826000
4.667,	56.58399000,	29.14336000,	36.16147000
4.750,	56.90195000,	29.94468000,	36.51766000
4.833,	57.21808000,	30.76015000,	36.87129000
4.917,	57.52485000,	31.57025000,	37.21415000
5.000,	57.82605000,	32.38458000,	37.55072000
5.083,	58.12523000,	33.21299000,	37.88520000
5.167,	58.41528000,	34.03562000,	38.20977000
5.250,	58.70107000,	34.86228000,	38.52869000
5.333,	58.98468000,	35.70293000,	38.84589000
5.417,	59.25937000,	36.53745000,	39.15395000
5.500,	59.52982000,	37.37577000,	39.45687000
5.583,	59.79923000,	38.22803000,	39.75839000
5.667,	60.06120000,	39.07384000,	40.05146000
5.750,	60.31765000,	39.92327000,	40.33984000
5.833,	60.57292000,	40.78656000,	40.62707000
5.917,	60.82093000,	41.64307000,	40.90642000
6.000,	61.06474000,	42.50301000,	41.18147000
6.083,	61.30854000,	43.37678000,	41.45562000
6.167,	61.54523000,	44.24349000,	41.72242000
6.250,	61.77773000,	45.11348000,	41.98526000
6.333,	62.00879000,	45.99723000,	42.24737000
6.417,	62.23421000,	46.87364000,	42.50259000
6.500,	62.45546000,	47.75317000,	42.75416000
6.583,	62.67645000,	48.64644000,	43.00517000
6.667,	62.89065000,	49.53209000,	43.24969000
6.750,	63.10197000,	50.42073000,	43.49083000
6.833,	63.31294000,	51.32306000,	43.73155000
6.917,	63.51724000,	52.21754000,	43.96615000
7.000,	63.71869000,	53.11486000,	44.19762000
7.083,	63.91967000,	54.02585000,	44.42877000
7.167,	64.11541000,	54.92875000,	44.65414000
7.250,	64.30830000,	55.83437000,	44.87660000
7.333,	64.49934000,	56.75362000,	45.09884000

7.417,	64.68526000,	57.66455000,	45.31559000
7.500,	64.86835000,	58.57806000,	45.52961000

MOD-0002 RD
ATTACHMENT 15

RUN TCISO - CHLORINE TRANS. ACCIDENT WITH CC ISOLATION AT T=50 SECONDS

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating
Concentrations Of Toxic Substances At
Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 2/17/2000 RUN TIME = 08:17:25

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	8.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                     =      Chlorine
Molecular Weight           (gm/mole) =       70.9
Heat of Vapor.                (j/gm) =      288.0
Initial Boiling Point            (C) =      -34.1
Heat Capacity              (j/gm-C) =         .946
Specific Gravity                      =       1.570
Diffusion Coef.         (cm**2/sec) =         .079


MODEL PARAMETERS:
Puff Release Interval                (sec) =   10
Time Step                            (sec) =    5
Delay Between Release and Intake     (sec) =  300
Threshold Concentration              (ppm) =    3.49E-04
To convert ppm to g/m**3, multiply by      =    2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                    (ppm) =    1.28E+03
Exposure Two Minutes After Arrival    (g-sec/m**3) =    4.52E+02
Time From Plume Arrival to Max. Conc.        (sec) =   65.
Max. Conc. in Two Minutes After Arrival      (ppm) =    3.00E+03
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 2/17/2000 at 08:17:25"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000, 2, .00, 907.00, 673.25, 198.12, 35.63, .45, 3.79, 45.15, .01, -34.10, 1035.00, 217.00, 444.89, 21029.15, 22726.03

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2.3333, 16, .00, .00, 494.81, .00, 7.92,

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444.89,    5429.70,    7126.59
    2.5000,   17,         .00,        .00,     487.20,        .00,       7.61,
.32,        3.17,      31.52,        .01,     -34.10,    1035.00,     217.00,
444.89,    5257.29,    6954.17
    2.6667,   18,         .00,        .00,     479.88,        .00,       7.32,
.31,        3.14,      31.03,        .01,     -34.10,    1035.00,     217.00,
444.89,    5100.32,    6797.20
    2.8333,   19,         .00,        .00,     472.81,        .00,       7.06,
.31,        3.12,      30.57,        .01,     -34.10,    1035.00,     217.00,
444.89,    4956.62,    6653.50
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.30,        3.10,      30.12,        .01,     -34.10,    1035.00,     217.00,
444.89,    4824.42,    6521.30
    3.1667,   21,         .00,        .00,     459.40,        .00,       6.59,
.30,        3.07,      29.68,        .01,     -34.10,    1035.00,     217.00,
444.89,    4702.26,    6399.15
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.29,        3.05,      29.26,        .01,     -34.10,    1035.00,     217.00,
444.89,    4588.94,    6285.82
    3.5000,   23,         .00,        .00,     446.82,        .00,       6.19,
.29,        3.03,      28.85,        .01,     -34.10,    1035.00,     217.00,
444.89,    4483.43,    6180.32
    3.6667,   24,         .00,        .00,     440.81,        .00,       6.01,
.28,        3.01,      28.46,        .01,     -34.10,    1035.00,     217.00,
444.89,    4384.88,    6081.77
    3.8333,   25,         .00,        .00,     434.97,        .00,       5.84,
.28,        2.99,      28.08,        .01,     -34.10,    1035.00,     217.00,
444.89,    4292.56,    5989.44
    4.0000,   26,         .00,        .00,     429.29,        .00,       5.68,
.28,        2.97,      27.71,        .01,     -34.10,    1035.00,     217.00,
444.89,    4205.83,    5902.72
    4.1667,   27,         .00,        .00,     423.77,        .00,       5.53,
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    4.3333,   28,         .00,        .00,     418.38,        .00,       5.38,
.27,        2.93,      26.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    4047.06,    5743.95
    4.5000,   29,         .00,        .00,     413.14,        .00,       5.25,
.27,        2.91,      26.65,        .01,     -34.10,    1035.00,     217.00,
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    4.6667,   30,         .00,        .00,     408.02,        .00,       5.12,
.26,        2.89,      26.31,        .01,     -34.10,    1035.00,     217.00,
444.89,    3905.01,    5601.90
    4.8333,   31,         .00,        .00,     403.02,        .00,       5.00,
.26,        2.88,      25.99,        .01,     -34.10,    1035.00,     217.00,
444.89,    3839.38,    5536.27
    5.0000,   32,         .00,        .00,     398.14,        .00,       4.88,
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.25,        2.84,      25.36,        .01,     -34.10,    1035.00,     217.00,
444.89,    3717.46,    5414.35
    5.3333,   34,         .00,        .00,     388.71,        .00,       4.66,
.25,        2.82,      25.06,        .01,     -34.10,    1035.00,     217.00,
444.89,    3660.70,    5357.59
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    6.0000,  38,          .00,        .00,     371.05,         .00,      4.28,
.24,         2.76,       23.91,         .01,    -34.10,    1035.00,     217.00,
444.89,    3457.17,    5154.06
    6.1667,  39,          .00,        .00,     366.86,         .00,      4.19,
.24,         2.74,       23.63,         .01,    -34.10,    1035.00,     217.00,
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.23,         2.73,       23.37,         .01,    -34.10,    1035.00,     217.00,
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.20,         2.54,       20.32,         .01,    -34.10,    1035.00,     217.00,
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444.89,    2835.57,    4532.46
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444.89,    2785.38,   4482.27
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.19,       2.47,      19.12,       .01,    -34.10,   1035.00,    217.00,
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   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,      17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,      17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,      16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
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444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,      16.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2461.28,   4158.16
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.16,       2.29,      16.41,       .01,    -34.10,   1035.00,    217.00,
444.89,    2444.59,   4141.48
   12.3333,  76,       .00,       .00,    252.95,       .00,      2.33,
.16,       2.27,      16.26,       .01,    -34.10,   1035.00,    217.00,
444.89,    2428.24,   4125.12
   12.5000,  77,       .00,       .00,    250.65,       .00,      2.30,
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.16, 2.26, 16.11, .01, -34.10, 1035.00, 217.00,
444.89, 2412.21, 4109.10

"CONCENTRATION AND EXPOSURE CHRONOLOGY"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"
"Run on 2/17/2000 at 08:17:25"

"TIME", "CONCENTRATION"	"EXPOSURE", "MEAN CONC.", "NUM OF PUFFS"
"(min)", "(ppm)", "(g-sec/m**3)", "(ppm)"	
.000, 8.81E-01, 1.25E-02, 8.81E-01, 32	
.083, 3.81E+00, 6.63E-02, 2.34E+00, 32	
.167, 1.33E+01, 2.54E-01, 6.00E+00, 33	
.250, 4.00E+01, 8.20E-01, 1.45E+01, 33	
.333, 1.04E+02, 2.28E+00, 3.23E+01, 34	
.417, 2.34E+02, 5.59E+00, 6.59E+01, 34	
.500, 4.65E+02, 1.22E+01, 1.23E+02, 35	
.583, 8.19E+02, 2.37E+01, 2.10E+02, 35	
.667, 1.29E+03, 4.20E+01, 3.30E+02, 36	
.750, 1.83E+03, 6.78E+01, 4.79E+02, 36	
.833, 2.35E+03, 1.01E+02, 6.49E+02, 37	
.917, 2.76E+03, 1.40E+02, 8.25E+02, 37	
1.000, 2.98E+03, 1.82E+02, 9.91E+02, 38	
1.083, 3.00E+03, 2.25E+02, 1.13E+03, 38	
1.167, 2.83E+03, 2.65E+02, 1.25E+03, 39	
1.250, 2.52E+03, 3.00E+02, 1.33E+03, 39	
1.333, 2.16E+03, 3.31E+02, 1.38E+03, 40	
1.417, 1.80E+03, 3.56E+02, 1.40E+03, 40	
1.500, 1.48E+03, 3.77E+02, 1.40E+03, 41	
1.583, 1.22E+03, 3.94E+02, 1.39E+03, 41	
1.667, 1.03E+03, 4.09E+02, 1.38E+03, 42	
1.750, 8.89E+02, 4.21E+02, 1.36E+03, 42	
1.833, 7.90E+02, 4.33E+02, 1.33E+03, 43	
1.917, 7.21E+02, 4.43E+02, 1.31E+03, 43	
2.000, 6.71E+02, 4.52E+02, 1.28E+03, 44	
2.083, 6.33E+02, 4.61E+02, 1.25E+03, 44	
2.167, 6.03E+02, 4.70E+02, 1.23E+03, 45	
2.250, 5.78E+02, 4.78E+02, 1.21E+03, 45	
2.333, 5.57E+02, 4.86E+02, 1.18E+03, 46	
2.417, 5.38E+02, 4.93E+02, 1.16E+03, 46	
2.500, 5.21E+02, 5.01E+02, 1.14E+03, 47	
2.583, 5.06E+02, 5.08E+02, 1.12E+03, 47	
2.667, 4.91E+02, 5.15E+02, 1.10E+03, 48	
2.750, 4.78E+02, 5.22E+02, 1.09E+03, 48	
2.833, 4.65E+02, 5.28E+02, 1.07E+03, 49	
2.917, 4.54E+02, 5.35E+02, 1.05E+03, 49	
3.000, 4.43E+02, 5.41E+02, 1.03E+03, 50	
3.083, 4.33E+02, 5.47E+02, 1.02E+03, 50	
3.167, 4.23E+02, 5.53E+02, 1.00E+03, 51	
3.250, 4.14E+02, 5.59E+02, 9.88E+02, 51	
3.333, 4.05E+02, 5.65E+02, 9.74E+02, 52	
3.417, 3.97E+02, 5.70E+02, 9.60E+02, 52	
3.500, 3.89E+02, 5.76E+02, 9.47E+02, 53	
3.583, 3.81E+02, 5.81E+02, 9.34E+02, 53	
3.667, 3.74E+02, 5.86E+02, 9.22E+02, 54	
3.750, 3.67E+02, 5.92E+02, 9.10E+02, 54	

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4.000,	3.48E+02,	6.07E+02,	8.76E+02,	56
4.083,	3.42E+02,	6.11E+02,	8.65E+02,	56
4.167,	3.37E+02,	6.16E+02,	8.55E+02,	57
4.250,	3.31E+02,	6.21E+02,	8.44E+02,	57
4.333,	3.26E+02,	6.25E+02,	8.35E+02,	58
4.417,	3.21E+02,	6.30E+02,	8.25E+02,	58
4.500,	3.16E+02,	6.35E+02,	8.16E+02,	59
4.583,	3.11E+02,	6.39E+02,	8.07E+02,	59
4.667,	3.07E+02,	6.43E+02,	7.98E+02,	60
4.750,	3.02E+02,	6.48E+02,	7.90E+02,	60
4.833,	2.98E+02,	6.52E+02,	7.81E+02,	61
4.917,	2.94E+02,	6.56E+02,	7.73E+02,	61
5.000,	2.90E+02,	6.60E+02,	7.65E+02,	62
5.083,	2.86E+02,	6.64E+02,	7.57E+02,	62
5.167,	2.82E+02,	6.68E+02,	7.50E+02,	63
5.250,	2.79E+02,	6.72E+02,	7.43E+02,	63
5.333,	2.75E+02,	6.76E+02,	7.35E+02,	64
5.417,	2.71E+02,	6.80E+02,	7.28E+02,	64
5.500,	2.68E+02,	6.83E+02,	7.21E+02,	65
5.583,	2.65E+02,	6.87E+02,	7.15E+02,	65
5.667,	2.62E+02,	6.91E+02,	7.08E+02,	66
5.750,	2.58E+02,	6.95E+02,	7.02E+02,	66
5.833,	2.55E+02,	6.98E+02,	6.95E+02,	67
5.917,	2.52E+02,	7.02E+02,	6.89E+02,	67
6.000,	2.49E+02,	7.05E+02,	6.83E+02,	68
6.083,	2.47E+02,	7.09E+02,	6.77E+02,	68
6.167,	2.44E+02,	7.12E+02,	6.72E+02,	69
6.250,	2.41E+02,	7.16E+02,	6.66E+02,	69
6.333,	2.38E+02,	7.19E+02,	6.60E+02,	70
6.417,	2.36E+02,	7.22E+02,	6.55E+02,	70
6.500,	2.33E+02,	7.26E+02,	6.50E+02,	71
6.583,	2.31E+02,	7.29E+02,	6.44E+02,	71
6.667,	2.28E+02,	7.32E+02,	6.39E+02,	72
6.750,	2.26E+02,	7.35E+02,	6.34E+02,	72
6.833,	2.24E+02,	7.38E+02,	6.29E+02,	73
6.917,	2.21E+02,	7.42E+02,	6.24E+02,	73
7.000,	2.19E+02,	7.45E+02,	6.20E+02,	74
7.083,	2.17E+02,	7.48E+02,	6.15E+02,	74
7.167,	2.15E+02,	7.51E+02,	6.10E+02,	75
7.250,	2.13E+02,	7.54E+02,	6.06E+02,	75
7.333,	2.10E+02,	7.57E+02,	6.01E+02,	76
7.417,	2.08E+02,	7.60E+02,	5.97E+02,	76
7.500,	2.06E+02,	7.63E+02,	5.93E+02,	77

```
CHEM release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

STARTDATA:
          2           4           0      !Distance units & Flow Units used in
input, X/Q option flag
       -00.0      !Power level (MWt)
    10333.44      !Control room volume (m3)
       -00.0       -00.0       -00.0      !Core fractions:  Halogens (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Nobles (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Solids (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Sodiums (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Plutoniums (Elem.,
Org., Part.)
           0        .014      !====== Start of step  1,  StartTime (hrs),
EndTime (hrs)
           0      !Effluent Vertical velocity m/s
           0      !Effluent flow rate (m3/s)
           0      !Release height (m)
           0      !Building height (m)
           0      !Building cross sectional Area (m2)
           0      !Horizontal Distance to receptor (m)
           0      !Air intake height (m)
           0      !Windspeed (m/s)
           4      !Vertical dispersion class
           4      !Horizontal dispersion class
      2.6901      !Flow rate from unfiltered intake source #1 (m3/s)
           0      !Flow rate from unfiltered intake source #2 (m3/s)
           0      !Bottled air flow rate (m3/s)
           0      !Flow rate from filtered intake source #1 (m3/s)
           0           0           0      !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
           0      !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
           0           0           0      !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
           0      !Recirculation flow rate (m3/s)
           0           0           0      !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
           1      !Control room occupancy factor
        .014           1      !====== Start of step  2,  StartTime (hrs),
EndTime (hrs)
           0      !Effluent Vertical velocity m/s
           0      !Effluent flow rate (m3/s)
           0      !Release height (m)
           0      !Building height (m)
           0      !Building cross sectional Area (m2)
           0      !Horizontal Distance to receptor (m)
           0      !Air intake height (m)
           0      !Windspeed (m/s)
           4      !Vertical dispersion class
           4      !Horizontal dispersion class
    .2468285      !Flow rate from unfiltered intake source #1 (m3/s)
           0      !Flow rate from unfiltered intake source #2 (m3/s)
           0      !Bottled air flow rate (m3/s)
```

```
           0       !Flow rate from filtered intake source #1 (m3/s)
           0            0           0       !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
           0       !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
           0            0           0       !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
           0       !Recirculation flow rate (m3/s)
           0            0           0       !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
           1       !Control room occupancy factor
           1            1      !====== Start of step  3,  StartTime (hrs),
EndTime (hrs)
           0       !Effluent Vertical velocity m/s
           0       !Effluent flow rate (m3/s)
           0       !Release height (m)
           0       !Building height (m)
           0       !Building cross sectional Area (m2)
           0       !Horizontal Distance to receptor (m)
           0       !Air intake height (m)
           0       !Windspeed (m/s)
           4       !Vertical dispersion class
           4       !Horizontal dispersion class
    .2468285       !Flow rate from unfiltered intake source #1 (m3/s)
           0       !Flow rate from unfiltered intake source #2 (m3/s)
           0       !Bottled air flow rate (m3/s)
           0       !Flow rate from filtered intake source #1 (m3/s)
           0            0           0       !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
           0       !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
           0            0           0       !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
           0       !Recirculation flow rate (m3/s)
           0            0           0       !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
           1       !Control room occupancy factor
```

"C H E M C O D E"

"Control room flow file: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOCB.INP
!CONHAB-CHEM
 flow d"
"CHEM release. Used by CHEM and CONHAB."
"HABIT release design specification file 14:10:53 11-15-1999"
" "
"CONTROL ROOM VOLUME = ","   10333.440000"" (m**3)"
"EXTRAN File: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.CNX !EXTRAN output
chro"
"EXTRAN Concentration and exposure chronology output"
" "
"EXTRAN release. Used by CHEM and CONHAB."
"HABIT release design specification file 14:10:53 11-15-1999"
" "
" "
"Run on 2/17/2000 at 08:17:25"
"UNITS: (ppm)   (g-sec/m**3) 2.8278E-03"
"TIME   CONCENTRATION   EXPOSURE   MEAN CONC.   NUM OF PUFFS"
"(min)   (ppm)   (g-sec/m**3)   (ppm)"
"CHEM output table: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOCH.TAB !CHEM
table output
"
"Spreadsheet output file:: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOCH.SPD
!CHEM outp
ut file f"

"TIME",	"CONCENTRATION",	"EXPOSURE",	"MEAN CONC"
"min",	"(ppm)",	"(g-sec/m**3)",	"(ppm)"
.000,	.00114142,	.00001607,	.00114142
.083,	.00613560,	.00010352,	.00365347
.167,	.02335915,	.00043247,	.01019575
.250,	.07515293,	.00149081,	.02638628
.333,	.21141930,	.00450398,	.06365912
.417,	.51431600,	.01174681,	.13846820
.500,	1.11610400,	.02746428,	.27765130
.583,	2.18851400,	.05865524,	.51829980
.667,	3.85700400,	.11297130,	.88778310
.750,	6.22295700,	.20060570,	1.41937900
.833,	9.29612000,	.33309510,	2.14091300
.917,	9.62330800,	.46861480,	2.76195100
1.000,	9.97662500,	.60910990,	3.31487600
1.083,	10.33657000,	.75642810,	3.82029400
1.167,	10.67196000,	.90671520,	4.27524400
1.250,	10.97043000,	1.06120600,	4.69212400
1.333,	11.22913000,	1.22124500,	5.07963900
1.417,	11.44190000,	1.38237500,	5.43168400
1.500,	11.61658000,	1.54596400,	5.75597100
1.583,	11.76205000,	1.71359900,	6.05861800
1.667,	11.88317000,	1.88094300,	6.33486700
1.750,	11.98750000,	2.04975600,	6.59082400
1.833,	12.08115000,	2.22193800,	6.83140200
1.917,	12.16548000,	2.39325700,	7.05276600
2.000,	12.24384000,	2.56568100,	7.25961200
2.083,	12.31857000,	2.74124600,	7.45571400
2.167,	12.38883000,	2.91571100,	7.63769100
2.250,	12.45611000,	3.09112400,	7.80911300

2.333,	12.52166000,	3.26958400,	7.97289200
2.417,	12.58416000,	3.44680000,	8.12598600
2.500,	12.64464000,	3.62486700,	8.27118500
2.583,	12.70403000,	3.80592700,	8.41080200
2.667,	12.76092000,	3.98563100,	8.54209600
2.750,	12.81626000,	4.16611600,	8.66731900
2.833,	12.87069000,	4.34955000,	8.78836300
2.917,	12.92316000,	4.53154000,	8.90275900
3.000,	12.97432000,	4.71425000,	9.01237300
3.083,	13.02488000,	4.89988200,	9.11879800
3.167,	13.07365000,	5.08399100,	9.21979900
3.250,	13.12134000,	5.26877200,	9.31695700
3.333,	13.16851000,	5.45645100,	9.41164000
3.417,	13.21417000,	5.64253900,	9.50181400
3.500,	13.25887000,	5.82925600,	9.58884600
3.583,	13.30313000,	6.01885400,	9.67392900
3.667,	13.34604000,	6.20679800,	9.75520500
3.750,	13.38810000,	6.39533500,	9.83387200
3.833,	13.42983000,	6.58673900,	9.91098700
3.917,	13.47034000,	6.77643400,	9.98484400
4.000,	13.51013000,	6.96669000,	10.05651000
4.083,	13.54967000,	7.15980100,	10.12692000
4.167,	13.58815000,	7.35115600,	10.19452000
4.250,	13.62590000,	7.54304200,	10.26025000
4.333,	13.66351000,	7.73777500,	10.32497000
4.417,	13.70006000,	7.93070600,	10.38722000
4.500,	13.73602000,	8.12414400,	10.44787000
4.583,	13.77180000,	8.32042000,	10.50770000
4.667,	13.80668000,	8.51485200,	10.56534000
4.750,	13.84096000,	8.70976700,	10.62160000
4.833,	13.87517000,	8.90751700,	10.67718000
4.917,	13.90849000,	9.10338300,	10.73082000
5.000,	13.94133000,	9.29971100,	10.78324000
5.083,	13.97408000,	9.49887100,	10.83512000
5.167,	14.00596000,	9.69610900,	10.88525000
5.250,	14.03748000,	9.89379100,	10.93431000
5.333,	14.06890000,	10.09430000,	10.98291000
5.417,	14.09946000,	10.29286000,	11.02994000
5.500,	14.12966000,	10.49184000,	11.07603000
5.583,	14.15986000,	10.69365000,	11.12174000
5.667,	14.18934000,	10.89347000,	11.16602000
5.750,	14.21834000,	11.09370000,	11.20945000
5.833,	14.24733000,	11.29675000,	11.25258000
5.917,	14.27561000,	11.49779000,	11.29440000
6.000,	14.30353000,	11.69921000,	11.33545000
6.083,	14.33154000,	11.90347000,	11.37626000
6.167,	14.35886000,	12.10568000,	11.41587000
6.250,	14.38581000,	12.30826000,	11.45480000
6.333,	14.41273000,	12.51368000,	11.49352000
6.417,	14.43909000,	12.71701000,	11.53113000
6.500,	14.46509000,	12.92072000,	11.56812000
6.583,	14.49115000,	13.12725000,	11.60495000
6.667,	14.51655000,	13.33167000,	11.64075000
6.750,	14.54171000,	13.53646000,	11.67599000
6.833,	14.56692000,	13.74407000,	11.71110000
6.917,	14.59147000,	13.94955000,	11.74525000
7.000,	14.61579000,	14.15538000,	11.77889000
7.083,	14.64015000,	14.36403000,	11.81242000
7.167,	14.66398000,	14.57053000,	11.84507000
7.250,	14.68758000,	14.77737000,	11.87724000
7.333,	14.71109000,	14.98703000,	11.90933000

```
7.417,      14.73408000,      15.19453000,      11.94059000
7.500,      14.75683000,      15.40234000,      11.97142000
```

M-00 0002 AC
ATTACHMENT 16 -
Pg 1 of 1

TUBING WALL THICKNESS

On Tables 1, 2, 3, 4 and 5 are shown working pressure ratings of tubing in a wide range of wall thicknesses. Allowable pressure ratings are calculated from S values as specified by ANSI Code B31.3.

SWAGELOK Tube Fittings have been repeatedly tested to the burst of the tubing in both the minimum and maximum wall thicknesses shown.

SWAGELOK Tube Fittings are not normally recommended for tube wall thicknesses outside the ranges shown in Tables 1 through 5 for each size. If you plan to use tubing with lighter or heavier wall than those shown, please have your Authorized Sales & Service Representative send a sample to the factory for testing.

GAS SERVICE

Gasses (air, hydrogen, helium & nitrogen, etc.) have very small molecules which can escape through even the most minute leak-path. Some surface defects on the tubing can provide such a leak-path. As tube O.D. increases, so does the likelihood of a scratch or other surface defects interfering with proper sealing.

The most successful connection for gas service will occur if all installation instructions are carefully followed and the heavier wall thicknesses of tubing on Tables 1 through 5 are selected.

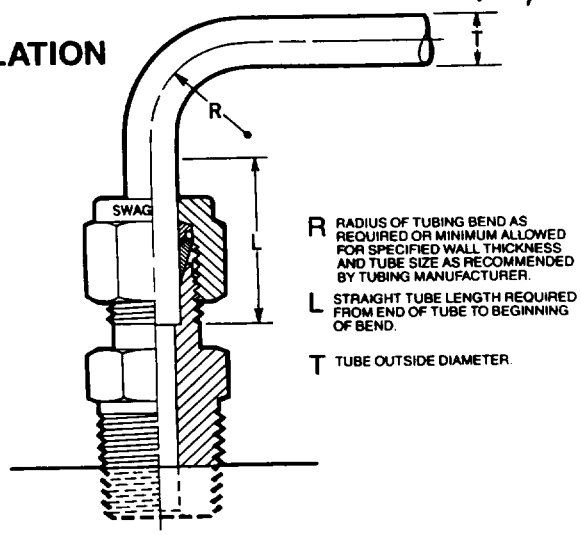
A heavy wall tube resists ferrule action more than a thin wall tube, allowing the ferrules to coin out minor surface imperfections. A thin wall tube will collapse, thus offering little resistance to ferrule action during pull-up. This reduces the chance of coining out surface defects, such as scratches.

For the greatest safety factor against surface defects in any gas system, use a wall thickness no less than the following:

TUBING FOR GAS SERVICE

Tube O.D.	Suggested Minimum Wall Thickness	Tube O.D.	Suggested Minimum Wall Thickness
1/8"	.028"	3/4"	.062"
3/16"	.028"	7/8"	.073"
1/4"	.028"	1"	.083"
5/16"	.035"	1-1/4"	.104"
3/8"	.035"	1-1/2"	.125"
1/2"	.041"	2"	.167"
5/8"	.052"		

TUBING INSTALLATION



R RADIUS OF TUBING BEND AS REQUIRED OR MINIMUM ALLOWED FOR SPECIFIED WALL THICKNESS AND TUBE SIZE AS RECOMMENDED BY TUBING MANUFACTURER.

L STRAIGHT TUBE LENGTH REQUIRED FROM END OF TUBE TO BEGINNING OF BEND.

T TUBE OUTSIDE DIAMETER.

Tubing properly selected and handled, when combined with the quality of SWAGELOK fittings, will give you leak-free systems.

Properly installed on such tubing, SWAGELOK fittings will give reliable service under a wide variety of fluid applications.

When installing fittings near tube bends, there must be a sufficient straight length of tubing to allow the tube to be bottomed in the SWAGELOK fitting:

T Tube O.D.		1/16	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8	1 in.	1 1/4	1 1/2	2
L Length of Straight Tube	A*	1/2	23/32	3/4	13/16	7/8	15/16	1 3/16	1 1/4	1 1/4	1 5/16	1 1/2	2	2 13/32	3 1/4
	B*	13/32	19/32	5/8	11/16	23/32	3/4	31/32	1 1/32	1 1/32	1 3/32	1 9/32	1 13/16	2 7/32	3 1/32
R		Radius of tube bend as recommended by bender manufacturer.													

*NOTE: Dimensions in Row A represent recommended straight tube length. Dimensions in Row B to be used when an absolute minimum straight tube length is necessary.

For maximum assurance of reliable performance use SWAGELOK Tube Fittings assembled in accordance with catalog instructions, and use properly selected and handled high quality tubing.

When installing steel or stainless steel SWAGELOK Tube Fittings over 1", we suggest the use of a SWAGELOK Hydraulic Swaging Unit. This unit increases reliability and reduces greatly the work involved in making up 1-1/4", 1-1/2", and 2" SWAGELOK Tube Fittings. Ask your local distributor for a demonstration.

SUGGESTED ALLOWABLE PRESSURE TABLES

A. All pressures are calculated from equations in ANSI Code for Pressure Piping ASME/ANSI B31.3.
B. All calculations are based on **maximum** O.D. and **minimum** wall thickness.
Example: 1/2" O.D. x .035" wall stainless steel tubing purchased to ASTM A269:

O.D. Tolerance ± .005" / Wall Thickness Tolerance ± 15%
Calculations are based on a .505" O.D. x .0298" wall tubing.
C. No allowance is made for corrosion or erosion.

TABLE 1 — ALUMINUM TUBING

Based on ultimate tensile strength 42,000 psi (289,400 kPa). For metal temperatures −20° to 100°F (−29° to 37°C). Allowable working pressure loads calculated from S values (14,000 psi-96,500 kPa) as specified by ANSI B31.3 code.

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)					SWAGELOK FITTING SERIES
	.035	.049	.065	.083	.095	
1/8	8600	WORKING PRESSURE (PSIG)				200
3/16	5600	8000				300
1/4	4000	5900	NOTE: For tubing for gas service use only tube wall thickness on outside of screened area. (See "Gas Service" above.)			400
5/16	3100	4600				500
3/8	2600	3700				600
1/2	1900	2700	3700			810
5/8	1500	2100	2900			1010
3/4		1700	2400	3100		1210
7/8		1500	2000			1410
1		1300	1700	2300	2700	1610

SUGGESTED ORDERING INFORMATION
High quality aluminum-alloy drawn seamless tubing ASTM B-210 or equivalent. (Values shown are for alloy 6061-T6.)

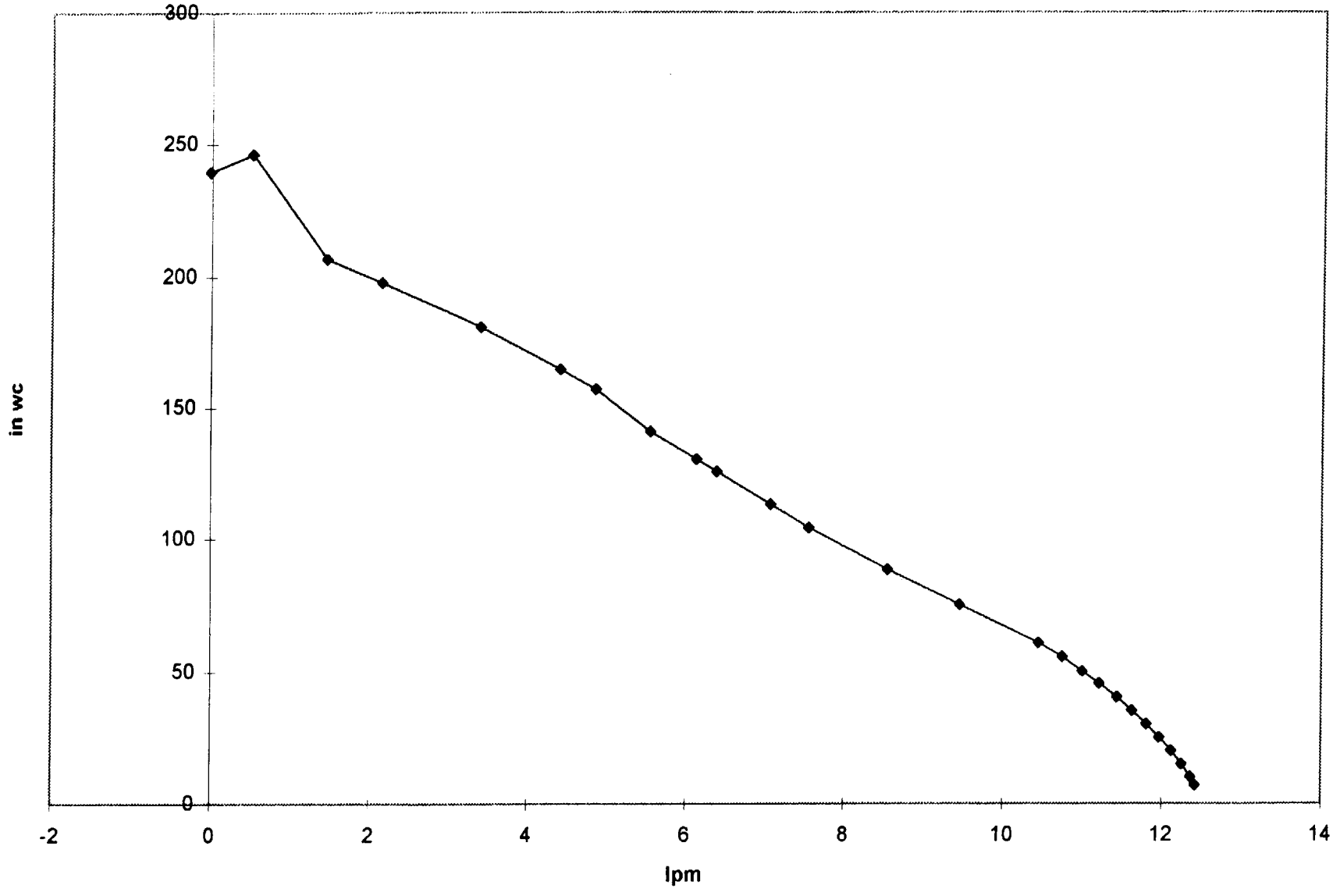
TABLE 2 — COPPER TUBING

Based on ultimate tensile strength 30,000 psi (206,700 kPa). For metal temperatures −20° to 100°F (−29° to 37°C). Allowable working pressure loads calculated from S values (6000 psi-41,300 kPa) as specified by ANSI B31.3 code.

TUBE O.D. (IN.)	TUBE WALL THICKNESS (INCHES)								SWAGELOK FITTING SERIES
	.028	.035	.049	.065	.083	.095	.109	.120	
1/8	2700	3600	WORKING PRESSURE (PSIG)						200
3/16	1800	2300	3400						300
1/4	1300	1600	2500	3500	NOTE: For tubing for gas service use only tube wall thickness on outside of screened area. (See "Gas Service" above.)				400
[redacted]		1300	1900	2700					500
[redacted]		1000	1600	2200					600
[redacted]		[redacted]	1100	1600	2100				810
[redacted]		[redacted]	[redacted]	1200	1600	1900			1010
[redacted]		[redacted]	[redacted]	1000	1300	1500	1800		1210
[redacted]		[redacted]	[redacted]	[redacted]	1100	1300	1500		1410
[redacted]		[redacted]	[redacted]	[redacted]	900	1100	1300	1500	1610

SUGGESTED ORDERING INFORMATION
High quality soft annealed seamless copper tubing ASTM B-75 or equivalent. Also soft annealed (Temper 0) copper water tube type K or type L to ASTM B-88.

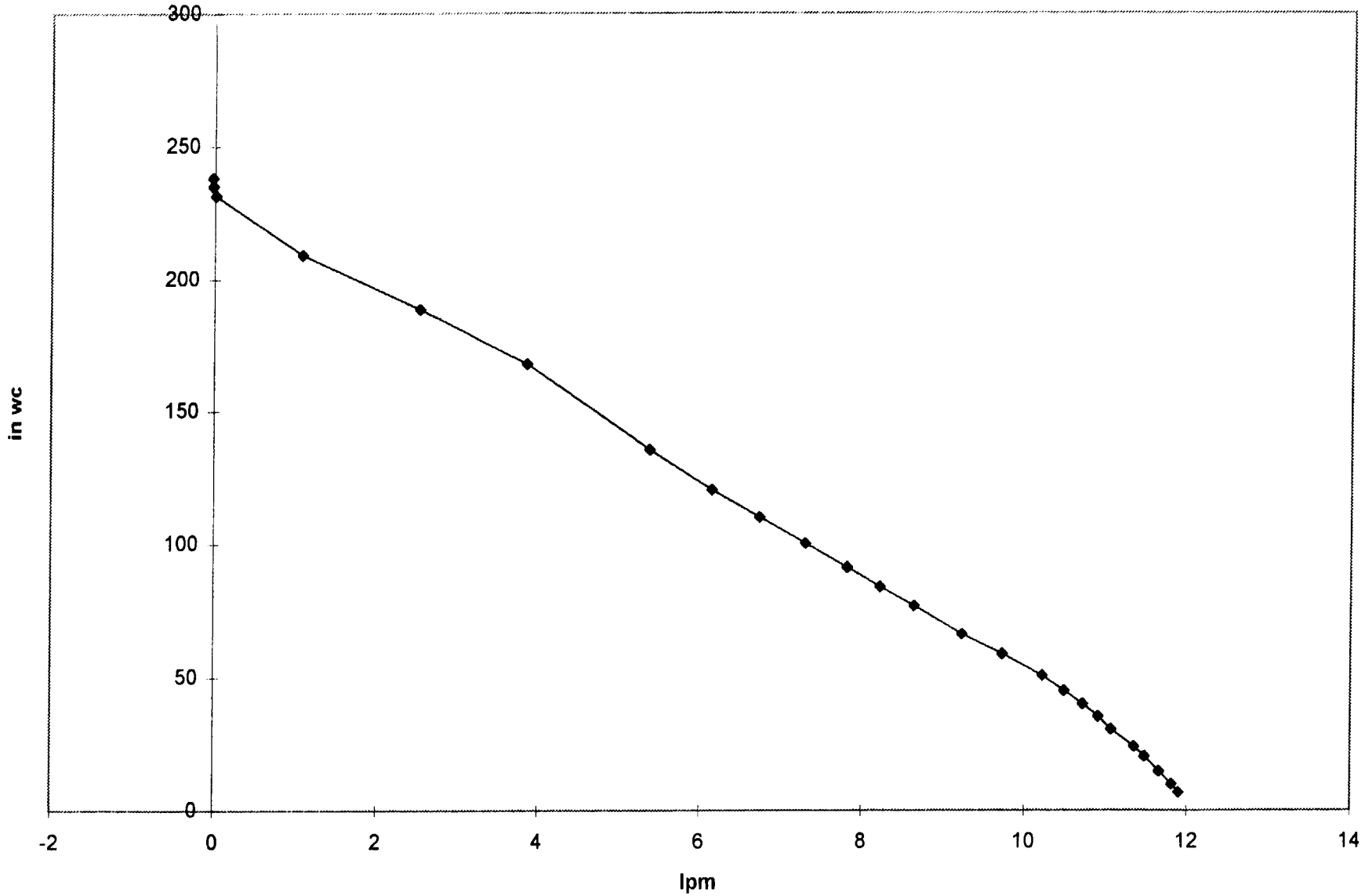
Toxic Gas Sample Pump Curve



M-00-0002 R0
Attachment 17
Pg 1 of 2

FILE: 329PMP.LOG

Toxic Gas Sample Pump Curve



M-00.0002 REV
ATTACHMENT 17
Pg 2 of 2

FILE: 338PMP.LOG

Chlorine Sensor
Time Response Test Results

Time	ppm	Percent of 6 ppm	Elapsed time(sec)
10:05:14	0.012	0%	Gas applied*
10:05:16	-0.355	-6%	2
10:05:17	-0.313	-5%	3
10:05:18	-0.038	-1%	4
10:05:20	0.298	5%	6
10:05:21	0.523	8%	7
10:05:22	0.752	12%	8
10:05:23	0.969	16%	9
10:05:25	1.175	19%	11
10:05:26	1.358	22%	12
10:05:27	1.538	25%	13

* - Concentration of test gas applied = 6 ppm

M-00-0002 (C1
ATTACHMENT 19

RUN -TCISO - CHLORINE TRANS. ACCIDENT WITH CC ISOLATION AT T = 48 SECONDS AND INLEAKAGE INCREASED TO 1107 CFM @ BASED ON AST RAD ANALYSES (INCLUDES REACHES)

EXTRAN output table

Program Title: EXTRAN VERSION 1.4

Developed For: U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
Division of Safety Issue Resolution

Date: December 1992

NRC Contact(s): C. Ferrell Phone: (FTS) 492 3944
Code Developer: J. V. Ramsdell Phone: (509) 376-8626
(FTS) 444-8626

Code Documentation:
EXTRAN: A Computer Code For Estimating Concentrations Of Toxic Substances At Control Room Air Intakes
NUREG/CR-5656

EXTRAN release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

RUN DATE = 8/28/2000 RUN TIME = 07:42:08

CONCENTRATION UNITS: ppm

SCENARIO:

Release Type		=	Liquid Tank Burst
Initial Mass	(kg)	=	907.
Release Height	(m)	=	.0
Storage Temperature	(C)	=	32.4
Maximum Pool Radius	(m)	=	.0
Intake Distance	(m)	=	366.
Intake Height	(m)	=	8.0
Building Area	(m**2)	=	0.

ENVIRONMENTAL CONDITIONS:

Wind Speed	(m/sec)	=	1.0
Atmospheric Stability Class		=	6
Air Temperature	(C)	=	32.4
Atmospheric Pressure	(mm Hg)	=	760.0
Solar Radiation	(watts/m**2)	=	1150.0
Cloud Cover	(tenths)	=	0

```
Ground Temperature                (C) =       32.4


EFFLUENT CHARACTERISTICS:
Material Released                     =      Chlorine
Molecular Weight           (gm/mole) =       70.9
Heat of Vapor.                (j/gm) =      288.0
Initial Boiling Point           (C) =      -34.1
Heat Capacity              (j/gm-C) =        .946
Specific Gravity                      =       1.570
Diffusion Coef.         (cm**2/sec) =        .079


MODEL PARAMETERS:
Puff Release Interval                (sec) =   10
Time Step                            (sec) =    5
Delay Between Release and Intake     (sec) =  300
Threshold Concentration              (ppm) =    3.49E-04
To convert ppm to g/m**3, multiply by      =    2.83E-03


RESULTS:
Average Concentration During First Two Minutes
     After Arrival of Plume                    (ppm) =    1.28E+03
Exposure Two Minutes After Arrival    (g-sec/m**3) =    4.52E+02
Time From Plume Arrival to Max. Conc.        (sec) =   65.
Max. Conc. in Two Minutes After Arrival      (ppm) =    3.00E+03
```

FILES USED:

Run design input file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.INP !EXTRAN release des

Table output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.TAB !EXTRAN table outpu

Concentration and exposure chronology output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.CNX !EXTRAN output file

Mass balance output file:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.MB !EXTRAN mass balance

File for use in spreadsheet:
C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.SPD !EXTRAN output file

"EXTRAN output to be imported into a spreadsheet as a quote and comma delimited file."

"MASS BALANCE VALUES"

"EXTRAN release. Used by CHEM and CONHAB.
"
"HABIT release design specification file 14:10:53 11-15-1999
"
"
"

"Run on 8/28/2000 at 07:42:08"

"TIME""NPUFFS""TANK", "CURRENT RELEASE", "POOL", "FLASHED", "EVAPORATED", "VOLUME", "RADIUS", "AREA", "DEPTH", "TEMPERATURE", "NET SW", "NET LW", "ATM CONV", "GRND COND", "NET FLUX"

.0000,	2,	.00,	907.00,	673.25,	198.12,	35.63,	.45,	3.79,	45.15,	.01,	-34.10,	1035.00,	217.00,	444.89,	21029.15,	22726.03
.1667,	3,	.00,	.00,	648.58,	.00,	24.67,	.43,	3.69,	42.88,	.01,	-34.10,	1035.00,	217.00,	444.89,	14869.85,	16566.74
.3333,	4,	.00,	.00,	628.73,	.00,	19.85,	.41,	3.63,	41.31,	.01,	-34.10,	1035.00,	217.00,	444.89,	12141.18,	13838.07
.5000,	5,	.00,	.00,	611.75,	.00,	16.98,	.40,	3.57,	40.05,	.01,	-34.10,	1035.00,	217.00,	444.89,	10514.57,	12211.46
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1.0000,	8,	.00,	.00,	570.73,	.00,	12.44,	.37,	3.44,	37.14,	.01,	-34.10,	1035.00,	217.00,	444.89,	7948.27,	9645.16
1.1667,	9,	.00,	.00,	559.20,	.00,	11.53,	.36,	3.40,	36.35,	.01,	-34.10,	1035.00,	217.00,	444.89,	7434.93,	9131.81
1.3333,	10,	.00,	.00,	548.43,	.00,	10.77,	.36,	3.37,	35.62,	.01,	-34.10,	1035.00,	217.00,	444.89,	7009.72,	8706.60
1.5000,	11,	.00,	.00,	538.31,	.00,	10.12,	.35,	3.33,	34.93,	.01,	-34.10,	1035.00,	217.00,	444.89,	6650.00,	8346.89
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1.8333,	13,	.00,	.00,	519.66,	.00,	9.08,	.34,	3.27,	33.68,	.01,	-34.10,	1035.00,	217.00,	444.89,	6070.59,	7767.48
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.32,         3.19,       32.02,        .01,    -34.10,    1035.00,     217.00,
444.89,    5429.70,    7126.59
    2.5000,  17,          .00,        .00,     487.20,         .00,       7.61,
.32,         3.17,       31.52,        .01,    -34.10,    1035.00,     217.00,
444.89,    5257.29,    6954.17
    2.6667,  18,          .00,        .00,     479.88,         .00,       7.32,
.31,         3.14,       31.03,        .01,    -34.10,    1035.00,     217.00,
444.89,    5100.32,    6797.20
    2.8333,  19,          .00,        .00,     472.81,         .00,       7.06,
.31,         3.12,       30.57,        .01,    -34.10,    1035.00,     217.00,
444.89,    4956.62,    6653.50
    3.0000,  20,          .00,        .00,     465.99,         .00,       6.82,
.30,         3.10,       30.12,        .01,    -34.10,    1035.00,     217.00,
444.89,    4824.42,    6521.30
    3.1667,  21,          .00,        .00,     459.40,         .00,       6.59,
.30,         3.07,       29.68,        .01,    -34.10,    1035.00,     217.00,
444.89,    4702.26,    6399.15
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.29,         3.05,       29.26,        .01,    -34.10,    1035.00,     217.00,
444.89,    4588.94,    6285.82
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.29,         3.03,       28.85,        .01,    -34.10,    1035.00,     217.00,
444.89,    4483.43,    6180.32
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.28,         3.01,       28.46,        .01,    -34.10,    1035.00,     217.00,
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.28,         2.97,       27.71,        .01,    -34.10,    1035.00,     217.00,
444.89,    4205.83,    5902.72
    4.1667,  27,          .00,        .00,     423.77,         .00,       5.53,
.27,         2.95,       27.34,        .01,    -34.10,    1035.00,     217.00,
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    4.3333,  28,          .00,        .00,     418.38,         .00,       5.38,
.27,         2.93,       26.99,        .01,    -34.10,    1035.00,     217.00,
444.89,    4047.06,    5743.95
    4.5000,  29,          .00,        .00,     413.14,         .00,       5.25,
.27,         2.91,       26.65,        .01,    -34.10,    1035.00,     217.00,
444.89,    3974.14,    5671.02
    4.6667,  30,          .00,        .00,     408.02,         .00,       5.12,
.26,         2.89,       26.31,        .01,    -34.10,    1035.00,     217.00,
444.89,    3905.01,    5601.90
    4.8333,  31,          .00,        .00,     403.02,         .00,       5.00,
.26,         2.88,       25.99,        .01,    -34.10,    1035.00,     217.00,
444.89,    3839.38,    5536.27
    5.0000,  32,          .00,        .00,     398.14,         .00,       4.88,
.26,         2.86,       25.67,        .01,    -34.10,    1035.00,     217.00,
444.89,    3776.95,    5473.83
    5.1667,  33,          .00,        .00,     393.38,         .00,       4.77,
.25,         2.84,       25.36,        .01,    -34.10,    1035.00,     217.00,
444.89,    3717.46,    5414.35
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.25,         2.82,       25.06,        .01,    -34.10,    1035.00,     217.00,
444.89,    3660.70,    5357.59
    5.5000,  35,          .00,        .00,     384.16,         .00,       4.56,
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ATT 19-pg 5

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.25,       2.81,      24.76,       .01,     -34.10,    1035.00,     217.00,
444.89,    3606.47,    5303.36
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.24,       2.79,      24.47,       .01,     -34.10,    1035.00,     217.00,
444.89,    3554.57,    5251.46
    5.8333,  37,         .00,       .00,     375.33,        .00,       4.37,
.24,       2.77,      24.18,       .01,     -34.10,    1035.00,     217.00,
444.89,    3504.86,    5201.74
    6.0000,  38,         .00,       .00,     371.05,        .00,       4.28,
.24,       2.76,      23.91,       .01,     -34.10,    1035.00,     217.00,
444.89,    3457.17,    5154.06
    6.1667,  39,         .00,       .00,     366.86,        .00,       4.19,
.24,       2.74,      23.63,       .01,     -34.10,    1035.00,     217.00,
444.89,    3411.38,    5108.26
    6.3333,  40,         .00,       .00,     362.75,        .00,       4.11,
.23,       2.73,      23.37,       .01,     -34.10,    1035.00,     217.00,
444.89,    3367.36,    5064.25
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.23,       2.71,      23.10,       .01,     -34.10,    1035.00,     217.00,
444.89,    3325.00,    5021.89
    6.6667,  42,         .00,       .00,     354.77,        .00,       3.95,
.23,       2.70,      22.85,       .01,     -34.10,    1035.00,     217.00,
444.89,    3284.20,    4981.09
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.23,       2.68,      22.60,       .01,     -34.10,    1035.00,     217.00,
444.89,    3244.87,    4941.75
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.22,       2.67,      22.35,       .01,     -34.10,    1035.00,     217.00,
444.89,    3206.91,    4903.80
    7.1667,  45,         .00,       .00,     343.35,        .00,       3.74,
.22,       2.65,      22.11,       .01,     -34.10,    1035.00,     217.00,
444.89,    3170.26,    4867.15
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.22,       2.62,      21.64,       .01,     -34.10,    1035.00,     217.00,
444.89,    3100.58,    4797.47
    7.6667,  48,         .00,       .00,     332.53,        .00,       3.54,
.21,       2.61,      21.41,       .01,     -34.10,    1035.00,     217.00,
444.89,    3067.42,    4764.30
    7.8333,  49,         .00,       .00,     329.05,        .00,       3.48,
.21,       2.60,      21.18,       .01,     -34.10,    1035.00,     217.00,
444.89,    3035.30,    4732.18
    8.0000,  50,         .00,       .00,     325.63,        .00,       3.42,
.21,       2.58,      20.96,       .01,     -34.10,    1035.00,     217.00,
444.89,    3004.16,    4701.05
    8.1667,  51,         .00,       .00,     322.27,        .00,       3.36,
.21,       2.57,      20.74,       .01,     -34.10,    1035.00,     217.00,
444.89,    2973.97,    4670.86
    8.3333,  52,         .00,       .00,     318.96,        .00,       3.31,
.21,       2.56,      20.53,       .01,     -34.10,    1035.00,     217.00,
444.89,    2944.67,    4641.56
    8.5000,  53,         .00,       .00,     315.71,        .00,       3.25,
.20,       2.54,      20.32,       .01,     -34.10,    1035.00,     217.00,
444.89,    2916.22,    4613.10
    8.6667,  54,         .00,       .00,     312.50,        .00,       3.20,
.20,       2.53,      20.11,       .01,     -34.10,    1035.00,     217.00,
444.89,    2888.58,    4585.46
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ATT 19-Pg 6

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    8.8333,  55,       .00,       .00,    309.35,       .00,      3.15,
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444.89,    2861.70,   4558.59
    9.0000,  56,       .00,       .00,    306.25,       .00,      3.10,
.20,       2.50,     19.70,       .01,    -34.10,   1035.00,    217.00,
444.89,    2835.57,   4532.46
    9.1667,  57,       .00,       .00,    303.20,       .00,      3.05,
.20,       2.49,     19.51,       .01,    -34.10,   1035.00,    217.00,
444.89,    2810.14,   4507.02
    9.3333,  58,       .00,       .00,    300.19,       .00,      3.01,
.19,       2.48,     19.31,       .01,    -34.10,   1035.00,    217.00,
444.89,    2785.38,   4482.27
    9.5000,  59,       .00,       .00,    297.23,       .00,      2.96,
.19,       2.47,     19.12,       .01,    -34.10,   1035.00,    217.00,
444.89,    2761.26,   4458.15
    9.6667,  60,       .00,       .00,    294.32,       .00,      2.92,
.19,       2.45,     18.93,       .01,    -34.10,   1035.00,    217.00,
444.89,    2737.76,   4434.65
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.19,       2.44,     18.75,       .01,    -34.10,   1035.00,    217.00,
444.89,    2714.85,   4411.74
   10.0000,  62,       .00,       .00,    288.62,       .00,      2.83,
.19,       2.43,     18.56,       .01,    -34.10,   1035.00,    217.00,
444.89,    2692.51,   4389.39
   10.1667,  63,       .00,       .00,    285.83,       .00,      2.79,
.18,       2.42,     18.38,       .01,    -34.10,   1035.00,    217.00,
444.89,    2670.70,   4367.59
   10.3333,  64,       .00,       .00,    283.08,       .00,      2.75,
.18,       2.41,     18.21,       .01,    -34.10,   1035.00,    217.00,
444.89,    2649.42,   4346.31
   10.5000,  65,       .00,       .00,    280.37,       .00,      2.71,
.18,       2.40,     18.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2628.64,   4325.53
   10.6667,  66,       .00,       .00,    277.71,       .00,      2.67,
.18,       2.38,     17.86,       .01,    -34.10,   1035.00,    217.00,
444.89,    2608.34,   4305.23
   10.8333,  67,       .00,       .00,    275.07,       .00,      2.63,
.18,       2.37,     17.69,       .01,    -34.10,   1035.00,    217.00,
444.89,    2588.51,   4285.40
   11.0000,  68,       .00,       .00,    272.48,       .00,      2.60,
.18,       2.36,     17.52,       .01,    -34.10,   1035.00,    217.00,
444.89,    2569.12,   4266.01
   11.1667,  69,       .00,       .00,    269.92,       .00,      2.56,
.17,       2.35,     17.36,       .01,    -34.10,   1035.00,    217.00,
444.89,    2550.16,   4247.05
   11.3333,  70,       .00,       .00,    267.39,       .00,      2.52,
.17,       2.34,     17.19,       .01,    -34.10,   1035.00,    217.00,
444.89,    2531.61,   4228.50
   11.5000,  71,       .00,       .00,    264.90,       .00,      2.49,
.17,       2.33,     17.03,       .01,    -34.10,   1035.00,    217.00,
444.89,    2513.46,   4210.35
   11.6667,  72,       .00,       .00,    262.45,       .00,      2.46,
.17,       2.32,     16.87,       .01,    -34.10,   1035.00,    217.00,
444.89,    2495.70,   4192.59
   11.8333,  73,       .00,       .00,    260.02,       .00,      2.42,
.17,       2.31,     16.72,       .01,    -34.10,   1035.00,    217.00,
444.89,    2478.31,   4175.20
   12.0000,  74,       .00,       .00,    257.63,       .00,      2.39,
.17,       2.30,     16.56,       .01,    -34.10,   1035.00,    217.00,
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.16,        2.29,      16.41,         .01,     -34.10,    1035.00,     217.00,
444.89,    2444.59,    4141.48
   12.3333,  76,         .00,        .00,     252.95,         .00,       2.33,
.16,        2.27,      16.26,         .01,     -34.10,    1035.00,     217.00,
444.89,    2428.24,    4125.12
   12.5000,  77,         .00,        .00,     250.65,         .00,       2.30,
.16,        2.26,      16.11,         .01,     -34.10,    1035.00,     217.00,
444.89,    2412.21,    4109.10


 "CONCENTRATION AND EXPOSURE CHRONOLOGY"

       "EXTRAN release. Used by CHEM and CONHAB.
"
       "HABIT release design specification file 14:10:53 11-15-1999
"
       "
"
"Run on  8/28/2000 at 07:42:08"
"TIME", "CONCENTRATION""EXPOSURE", "MEAN CONC.", "NUM OF PUFFS"
"(min)", "(ppm)", "(g-sec/m**3)", "(ppm)"
    .000,     8.81E-01,     1.25E-02,     8.81E-01,  32
    .083,     3.81E+00,     6.63E-02,     2.34E+00,  32
    .167,     1.33E+01,     2.54E-01,     6.00E+00,  33
    .250,     4.00E+01,     8.20E-01,     1.45E+01,  33
    .333,     1.04E+02,     2.28E+00,     3.23E+01,  34
    .417,     2.34E+02,     5.59E+00,     6.59E+01,  34
    .500,     4.65E+02,     1.22E+01,     1.23E+02,  35
    .583,     8.19E+02,     2.37E+01,     2.10E+02,  35
    .667,     1.29E+03,     4.20E+01,     3.30E+02,  36
    .750,     1.83E+03,     6.78E+01,     4.79E+02,  36
    .833,     2.35E+03,     1.01E+02,     6.49E+02,  37
    .917,     2.76E+03,     1.40E+02,     8.25E+02,  37
   1.000,     2.98E+03,     1.82E+02,     9.91E+02,  38
   1.083,     3.00E+03,     2.25E+02,     1.13E+03,  38
   1.167,     2.83E+03,     2.65E+02,     1.25E+03,  39
   1.250,     2.52E+03,     3.00E+02,     1.33E+03,  39
   1.333,     2.16E+03,     3.31E+02,     1.38E+03,  40
   1.417,     1.80E+03,     3.56E+02,     1.40E+03,  40
   1.500,     1.48E+03,     3.77E+02,     1.40E+03,  41
   1.583,     1.22E+03,     3.94E+02,     1.39E+03,  41
   1.667,     1.03E+03,     4.09E+02,     1.38E+03,  42
   1.750,     8.89E+02,     4.21E+02,     1.36E+03,  42
   1.833,     7.90E+02,     4.33E+02,     1.33E+03,  43
   1.917,     7.21E+02,     4.43E+02,     1.31E+03,  43
   2.000,     6.71E+02,     4.52E+02,     1.28E+03,  44
   2.083,     6.33E+02,     4.61E+02,     1.25E+03,  44
   2.167,     6.03E+02,     4.70E+02,     1.23E+03,  45
   2.250,     5.78E+02,     4.78E+02,     1.21E+03,  45
   2.333,     5.57E+02,     4.86E+02,     1.18E+03,  46
   2.417,     5.38E+02,     4.93E+02,     1.16E+03,  46
   2.500,     5.21E+02,     5.01E+02,     1.14E+03,  47
   2.583,     5.06E+02,     5.08E+02,     1.12E+03,  47
   2.667,     4.91E+02,     5.15E+02,     1.10E+03,  48
   2.750,     4.78E+02,     5.22E+02,     1.09E+03,  48
   2.833,     4.65E+02,     5.28E+02,     1.07E+03,  49
   2.917,     4.54E+02,     5.35E+02,     1.05E+03,  49
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3.000,	4.43E+02,	5.41E+02,	1.03E+03,	50
3.083,	4.33E+02,	5.47E+02,	1.02E+03,	50
3.167,	4.23E+02,	5.53E+02,	1.00E+03,	51
3.250,	4.14E+02,	5.59E+02,	9.88E+02,	51
3.333,	4.05E+02,	5.65E+02,	9.74E+02,	52
3.417,	3.97E+02,	5.70E+02,	9.60E+02,	52
3.500,	3.89E+02,	5.76E+02,	9.47E+02,	53
3.583,	3.81E+02,	5.81E+02,	9.34E+02,	53
3.667,	3.74E+02,	5.86E+02,	9.22E+02,	54
3.750,	3.67E+02,	5.92E+02,	9.10E+02,	54
3.833,	3.60E+02,	5.97E+02,	8.98E+02,	55
3.917,	3.54E+02,	6.02E+02,	8.87E+02,	55
4.000,	3.48E+02,	6.07E+02,	8.76E+02,	56
4.083,	3.42E+02,	6.11E+02,	8.65E+02,	56
4.167,	3.37E+02,	6.16E+02,	8.55E+02,	57
4.250,	3.31E+02,	6.21E+02,	8.44E+02,	57
4.333,	3.26E+02,	6.25E+02,	8.35E+02,	58
4.417,	3.21E+02,	6.30E+02,	8.25E+02,	58
4.500,	3.16E+02,	6.35E+02,	8.16E+02,	59
4.583,	3.11E+02,	6.39E+02,	8.07E+02,	59
4.667,	3.07E+02,	6.43E+02,	7.98E+02,	60
4.750,	3.02E+02,	6.48E+02,	7.90E+02,	60
4.833,	2.98E+02,	6.52E+02,	7.81E+02,	61
4.917,	2.94E+02,	6.56E+02,	7.73E+02,	61
5.000,	2.90E+02,	6.60E+02,	7.65E+02,	62
5.083,	2.86E+02,	6.64E+02,	7.57E+02,	62
5.167,	2.82E+02,	6.68E+02,	7.50E+02,	63
5.250,	2.79E+02,	6.72E+02,	7.43E+02,	63
5.333,	2.75E+02,	6.76E+02,	7.35E+02,	64
5.417,	2.71E+02,	6.80E+02,	7.28E+02,	64
5.500,	2.68E+02,	6.83E+02,	7.21E+02,	65
5.583,	2.65E+02,	6.87E+02,	7.15E+02,	65
5.667,	2.62E+02,	6.91E+02,	7.08E+02,	66
5.750,	2.58E+02,	6.95E+02,	7.02E+02,	66
5.833,	2.55E+02,	6.98E+02,	6.95E+02,	67
5.917,	2.52E+02,	7.02E+02,	6.89E+02,	67
6.000,	2.49E+02,	7.05E+02,	6.83E+02,	68
6.083,	2.47E+02,	7.09E+02,	6.77E+02,	68
6.167,	2.44E+02,	7.12E+02,	6.72E+02,	69
6.250,	2.41E+02,	7.16E+02,	6.66E+02,	69
6.333,	2.38E+02,	7.19E+02,	6.60E+02,	70
6.417,	2.36E+02,	7.22E+02,	6.55E+02,	70
6.500,	2.33E+02,	7.26E+02,	6.50E+02,	71
6.583,	2.31E+02,	7.29E+02,	6.44E+02,	71
6.667,	2.28E+02,	7.32E+02,	6.39E+02,	72
6.750,	2.26E+02,	7.35E+02,	6.34E+02,	72
6.833,	2.24E+02,	7.38E+02,	6.29E+02,	73
6.917,	2.21E+02,	7.42E+02,	6.24E+02,	73
7.000,	2.19E+02,	7.45E+02,	6.20E+02,	74
7.083,	2.17E+02,	7.48E+02,	6.15E+02,	74
7.167,	2.15E+02,	7.51E+02,	6.10E+02,	75
7.250,	2.13E+02,	7.54E+02,	6.06E+02,	75
7.333,	2.10E+02,	7.57E+02,	6.01E+02,	76
7.417,	2.08E+02,	7.60E+02,	5.97E+02,	76
7.500,	2.06E+02,	7.63E+02,	5.93E+02,	77

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CHEM release. Used by CHEM and CONHAB.
HABIT release design specification file 14:10:53 11-15-1999

STARTDATA:
          2           4           0      !Distance units & Flow Units used in
input, X/Q option flag
       -00.0      !Power level (MWt)
    10333.44      !Control room volume (m3)
       -00.0       -00.0       -00.0      !Core fractions:  Halogens (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Nobles (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Solids (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Sodiums (Elem.,
Org., Part.)
       -00.0       -00.0       -00.0      !Core fractions:  Plutoniums (Elem.,
Org., Part.)
           0       .0133      !====== Start of step  1,  StartTime (hrs),
EndTime (hrs)
           0      !Effluent Vertical velocity m/s
           0      !Effluent flow rate (m3/s)
           0      !Release height (m)
           0      !Building height (m)
           0      !Building cross sectional Area (m2)
           0      !Horizontal Distance to receptor (m)
           0      !Air intake height (m)
           0      !Windspeed (m/s)
           4      !Vertical dispersion class
           4      !Horizontal dispersion class
      2.6901      !Flow rate from unfiltered intake source #1 (m3/s)
           0      !Flow rate from unfiltered intake source #2 (m3/s)
           0      !Bottled air flow rate (m3/s)
           0      !Flow rate from filtered intake source #1 (m3/s)
           0           0           0      !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
           0      !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
           0           0           0      !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
           0      !Recirculation flow rate (m3/s)
           0           0           0      !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
           1      !Control room occupancy factor
       .0133           1      !====== Start of step  2,  StartTime (hrs),
EndTime (hrs)
           0      !Effluent Vertical velocity m/s
           0      !Effluent flow rate (m3/s)
           0      !Release height (m)
           0      !Building height (m)
           0      !Building cross sectional Area (m2)
           0      !Horizontal Distance to receptor (m)
           0      !Air intake height (m)
           0      !Windspeed (m/s)
           4      !Vertical dispersion class
           4      !Horizontal dispersion class
    .5224459      !Flow rate from unfiltered intake source #1 (m3/s)
           0      !Flow rate from unfiltered intake source #2 (m3/s)
           0      !Bottled air flow rate (m3/s)
```

```
          0      !Flow rate from filtered intake source #1 (m3/s)
          0           0           0      !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
          0      !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
          0           0           0      !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
          0      !Recirculation flow rate (m3/s)
          0           0           0      !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
          1      !Control room occupancy factor
          1           1      !====== Start of step  3,  StartTime (hrs),
EndTime (hrs)
          0      !Effluent Vertical velocity m/s
          0      !Effluent flow rate (m3/s)
          0      !Release height (m)
          0      !Building height (m)
          0      !Building cross sectional Area (m2)
          0      !Horizontal Distance to receptor (m)
          0      !Air intake height (m)
          0      !Windspeed (m/s)
          4      !Vertical dispersion class
          4      !Horizontal dispersion class
    .5224459     !Flow rate from unfiltered intake source #1 (m3/s)
          0      !Flow rate from unfiltered intake source #2 (m3/s)
          0      !Bottled air flow rate (m3/s)
          0      !Flow rate from filtered intake source #1 (m3/s)
          0           0           0      !Filter efficiencies #1, (Elem.,
Org., Part.)(fraction)
          0      !Flow rate from filtered intake source #2 (feeds recirc,
m3/s)
          0           0           0      !Filter efficiencies #2, (Elem.,
Org., Part.)(fraction)
          0      !Recirculation flow rate (m3/s)
          0           0           0      !Recirc. filter efficiencies ,
(Elem., Org., Part.)(fraction)
          1      !Control room occupancy factor
```

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"C H E M C O D E"

"Control room flow file: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOCB.INP
!CONHAB-CHEM
 flow d"
"CHEM release. Used by CHEM and CONHAB."
"HABIT release design specification file 14:10:53 11-15-1999"
" "
"CONTROL ROOM VOLUME = ","   10333.440000"" (m**3)"
"EXTRAN File: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOEX.CNX !EXTRAN output chro"
"EXTRAN Concentration and exposure chronology output"
" "
"EXTRAN release. Used by CHEM and CONHAB."
"HABIT release design specification file 14:10:53 11-15-1999"
" "
" "
"Run on 8/28/2000 at 07:42:08"
"UNITS: (ppm)   (g-sec/m**3) 2.8278E-03"
"TIME   CONCENTRATION   EXPOSURE   MEAN CONC.   NUM OF PUFFS"
"(min)   (ppm)   (g-sec/m**3)   (ppm)"
"CHEM output table: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOCH.TAB !CHEM table
output
"
"Spreadsheet output file:: C:\HABIT\HAB_DEMO\DEMO1\REV1\TCISOCH.SPD !CHEM
outp
 ut file f"

"TIME", "min",	"CONCENTRATION", "(ppm)",	"EXPOSURE", "(g-sec/m**3)",	"MEAN CONC" "(ppm)"
.000,	.00114142,	.00001607,	.00114142
.083,	.00613560,	.00010352,	.00365347
.167,	.02335915,	.00043247,	.01019575
.250,	.07515293,	.00149081,	.02638628
.333,	.21141930,	.00450398,	.06365912
.417,	.51431600,	.01174681,	.13846820
.500,	1.11610400,	.02746428,	.27765130
.583,	2.18851400,	.05865524,	.51829980
.667,	3.85700400,	.11297130,	.88778310
.750,	6.22295700,	.20060570,	1.41937900
.833,	6.82011300,	.29780680,	1.91410300
.917,	7.51322900,	.40361140,	2.37883000
1.000,	8.26155500,	.51995410,	2.82967600
1.083,	9.02380200,	.64856260,	3.27552600
1.167,	9.73398500,	.78564080,	3.70436700
1.250,	10.36595000,	.93161850,	4.11915400
1.333,	10.91364000,	1.08716100,	4.52193300
1.417,	11.36404000,	1.24719500,	4.90052900
1.500,	11.73377000,	1.41243500,	5.25881100
1.583,	12.04162000,	1.58405300,	5.60059600
1.667,	12.29789000,	1.75723800,	5.91823900
1.750,	12.51860000,	1.93353000,	6.21711000
1.833,	12.71669000,	2.11477000,	6.50191200
1.917,	12.89500000,	2.29636300,	6.76722500
2.000,	13.06068000,	2.48028900,	7.01799600
2.083,	13.21863000,	2.66868300,	7.25835300
2.167,	13.36711000,	2.85692400,	7.48369800

NASAL DETECTION @ 3.5ppm

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NASAL DETECTION + 2 MIN

2.250,	13.50925000,	3.04716700,	7.69806600
2.333,	13.64773000,	3.24167700,	7.90484000
2.417,	13.77973000,	3.43572900,	8.09988600
2.500,	13.90743000,	3.63157900,	8.28650100
2.583,	14.03280000,	3.83157700,	8.46748700
2.667,	14.15288000,	4.03088400,	8.63908300
2.750,	14.26965000,	4.23183500,	8.80404500
2.833,	14.38449000,	4.43684500,	8.96474400
2.917,	14.49517000,	4.64097200,	9.11775200
3.000,	14.60304000,	4.84661900,	9.26542600
3.083,	14.70964000,	5.05626200,	9.40982600
3.167,	14.81243000,	5.26485800,	9.54780000
3.250,	14.91293000,	5.47486800,	9.68140500
3.333,	15.01231000,	5.68882600,	9.81245500
3.417,	15.10848000,	5.90159000,	9.93804600
3.500,	15.20261000,	6.11568000,	10.06000000
3.583,	15.29581000,	6.33367800,	10.17994000
3.667,	15.38611000,	6.55035200,	10.29517000
3.750,	15.47463000,	6.76827200,	10.40732000
3.833,	15.56241000,	6.99006900,	10.51787000
3.917,	15.64761000,	7.21042600,	10.62432000
4.000,	15.73128000,	7.43196100,	10.72813000
4.083,	15.81441000,	7.65734900,	10.83066000
4.167,	15.89527000,	7.88119400,	10.92957000
4.250,	15.97460000,	8.10615600,	11.02621000
4.333,	16.05359000,	8.33495200,	11.12182000
4.417,	16.13036000,	8.56210800,	11.21420000
4.500,	16.20585000,	8.79032600,	11.30460000
4.583,	16.28096000,	9.02236400,	11.39417000
4.667,	16.35415000,	9.25267000,	11.48084000
4.750,	16.42606000,	9.48399000,	11.56576000
4.833,	16.49780000,	9.71911700,	11.65002000
4.917,	16.56766000,	9.95243100,	11.73165000
5.000,	16.63650000,	10.18671000,	11.81174000
5.083,	16.70513000,	10.42480000,	11.89129000
5.167,	16.77191000,	10.66099000,	11.96846000
5.250,	16.83793000,	10.89811000,	12.04424000
5.333,	16.90371000,	11.13902000,	12.11960000
5.417,	16.96767000,	11.37796000,	12.19276000
5.500,	17.03087000,	11.61780000,	12.26468000
5.583,	17.09405000,	11.86143000,	12.33627000
5.667,	17.15571000,	12.10302000,	12.40584000
5.750,	17.21634000,	12.34547000,	12.47429000
5.833,	17.27692000,	12.59170000,	12.54247000
5.917,	17.33601000,	12.83584000,	12.60878000
6.000,	17.39433000,	13.08079000,	12.67407000
6.083,	17.45284000,	13.32953000,	12.73916000
6.167,	17.50987000,	13.57611000,	12.80252000
6.250,	17.56613000,	13.82349000,	12.86495000
6.333,	17.62230000,	14.07464000,	12.92723000
6.417,	17.67727000,	14.32358000,	12.98788000
6.500,	17.73148000,	14.57328000,	13.04769000
6.583,	17.78582000,	14.82677000,	13.10739000
6.667,	17.83874000,	15.07798000,	13.16556000
6.750,	17.89114000,	15.32993000,	13.22297000
6.833,	17.94366000,	15.58567000,	13.28029000
6.917,	17.99478000,	15.83908000,	13.33619000
7.000,	18.04538000,	16.09320000,	13.39138000
7.083,	18.09607000,	16.35111000,	13.44652000

7.167,	18.14564000,	16.60664000,	13.50031000
7.250,	18.19469000,	16.86287000,	13.55345000
7.333,	18.24356000,	17.12288000,	13.60657000
7.417,	18.29133000,	17.38046000,	13.65841000
7.500,	18.33859000,	17.63872000,	13.70964000