ILLINOIS POLLUTION CONTROL BOARD
April 19, 2012

IN THE MATTER OF:	)	
	)	
TIERED APPROACH TO CORRECTIVE	)	R11-9
ACTION OBJECTIVES (TACO) (INDOOR	)	(Rulemaking - Land)
INHALATION): AMENDMENTS TO 35	)	
ILL. ADM. CODE 742	)	

Proposed Rule. First Notice.

OPINION AND ORDER OF THE BOARD (by T.E. Johnson):

The Board today proposes amendments to the Tiered Approach to Corrective Action Objectives (TACO) rules (35 Ill. Adm. Code 742). The amendments are proposed for first-notice publication in the *Illinois Register* pursuant to the Administrative Procedure Act (APA) (5 ILCS 100/5-40 (2010)). Publication will begin a 45-day public comment period. Since 1997, the TACO rules have provided procedures for developing remediation objectives based upon risks posed to human health by environmental conditions at a variety of sites. The first-notice amendments include the addition of a new exposure route under TACO: the indoor inhalation exposure route. To protect building occupants, this exposure route addresses the potential for vapors to migrate into buildings from underlying volatile chemicals in soil or groundwater, a process commonly known as "vapor intrusion" or "VI."

The Board also proposes adding 13 chemicals to the TACO tables based upon the Board's pending rulemaking on groundwater quality standards, Proposed Amendments to Groundwater Quality Standards (35 Ill. Adm. Code 620) (Groundwater Quality), R08-18.[1] Further, the first-notice amendments to TACO update physical and chemical parameters and revise toxicity values in accordance with the new United States Environmental Protection Agency (USEPA) hierarchy for selecting human health toxicity values.

This rulemaking was initiated when the Illinois Environmental Protection Agency (IEPA or Agency) filed a proposal with the Board on November 9, 2010, under Section 27 of the Environmental Protection Act (Act) (415 ILCS 5/27 (2010)). After conducting two public hearings and considering the entire record, including public comments and IEPA *errata* sheets, the Board is adopting for first notice the amendments proposed or agreed to by IEPA, with minor clarifying changes. In addition, the Board requires that IEPA be notified if an indoor inhalation building control technology at a school is rendered inoperable. The amendments will become effective on a date certain 60 days after their final adoption.

This opinion is divided into six main parts. First, the Board sets forth the procedural history of this rulemaking and a brief description of the predecessor rulemaking, Proposed

[1] In R08-18, the Board has proceeded to first notice under the APA (5 ILCS 100/5-40 (2010)). *See* Groundwater Quality, R08-18 (Oct. 20, 2011).

Motions to Correct Hearing Transcripts

On April 14, 2011, IEPA filed a motion to correct the first hearing's transcript, which the hearing officer granted on the record at the second hearing. Tr.2 at 7. On June 10, 2011, IEPA filed a motion to correct the second hearing's transcript, which is granted. Accordingly, the Board directs the Clerk's Office to do the following: (1) have the respective docket entries for the first and second hearing transcripts reflect the granting of IEPA's corresponding motion to correct; and (2) physically and electronically attach to the respective fronts of the first and second hearing transcripts both this portion of the Board's opinion and IEPA's corresponding motion to correct.

Filing Public Comments on the First-Notice Proposal

First-notice publication in the *Illinois Register* of these proposed rule changes will start a period of at least 45 days during which anyone may file a public comment with the Board, regardless of whether the person has already filed a public comment. The Board encourages persons to file public comments on the proposed amendments. The docket number for this rulemaking, R11-9, should be indicated on the public comment.

Public comments must be filed with the Clerk of the Board. Public comments may be filed at the following address:

Pollution Control Board
John Therriault, Assistant Clerk
JRTC
100 W. Randolph Street, Suite 11-500
Chicago, IL 60601

In addition, public comments may be filed electronically through the Clerk's Office On-Line (COOL) on the Board's Web site at www.ipcb.state.il.us. Any questions about electronic filing through COOL should be directed to the Clerk's Office at (312) 814-3629.[6]

The transcripts of the Springfield and Chicago hearings were received by the Board on April 6 and June 1, 2011, respectively, and promptly placed in COOL. Many other documents from this rulemaking are also available through COOL, including Board opinions and orders, hearing officer orders, pre-filed testimony, and public comments.

Abbreviations Used in this Opinion

Abbreviations used by the Board in this opinion include the following:

[6] All filings with the Clerk must be served on the hearing officer and on those persons on the Service List for this rulemaking. The most recent version of the R11-9 Service List is available on COOL.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-9
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

NOTICE

Dorothy Gunn, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601
(Via First Class Mail)

Mitchell Cohen
Chief Legal Counsel
Illinois Dept. of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271
(Via First Class Mail)

Matt Dunn
Environmental Enf./Asbestos
Litigation Division
Illinois Attorney General's Office
69 W. Washington St., 18th Floor
Chicago, Illinois 60602
(Via First Class Mail)

Richard McGill
Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601
(Via First Class Mail)

Participants on the Service List
(Via First Class Mail)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the Illinois Environmental Protection Agency's ("Illinois EPA") Motion to Correct the Transcript a copy of each of which is herewith served upon you.

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: Kimberly A. Geving

Kimberly A. Geving
Assistant Counsel
Division of Legal Counsel

DATE: June 8, 2011

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276

(217) 782-5544

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-9
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

MOTION TO CORRECT THE TRANSCRIPT

NOW COMES the Illinois Environmental Protection Agency ("Illinois EPA") by one of its attorneys, Kimberly A. Geving, and pursuant to 35 Ill. Adm. Code 101.604 moves the hearing officer in this matter to correct the transcript of May 24, 2011 as follows:

Transcript Page	Line	Correction
5	6	Change "waive" to "wave"
7	5	Add the word "that" before "is"
9	7	Change "Geving's" to "Geving"
10	3	Change "need" to "needs"
10	12	Change "pre-filing" to "pre-filed"
10	22-23	Delete "Tomorrow will be testimony."
11	15	Change "values" to "value"
14	3	Change "sight" to "site"
14	4	Delete "the"
15	13	Change "revisions" to "provisions"
15	24	Change "USG" to "UST"
16	16	Change "is" to "has"
16	20	Change "but" to "by"
17	13	Change "hurtle" to "hurdle"
21	24	Delete "In" and begin with "Using" and change "principals" to "principles"
22	1	Change "from" to "than"
23	12	Change "been trying" to "been, to trying"
23	14	Change "he" to "we"
28	16	Change "containments" to "contaminants"

28	22	Delete "a"
29	12	Change "we found" to "confound"
32	8	Change "and" to "in"
32	16	Change "innumerating" to "enumerating"
33	7	Change "engineering" to "engineered"
33	8	Change "that" to "in"
35	21	Change "them" to "out"
35	24	Change "in" to "and"
36	6	Change "engineering" to "engineered"
36	8	Add "if" after "us"
38	19	Change "like I say" to "what I said"
39	18	Change "ceiling" to "sealing"
43	8	Change "provision" to "submission"
45	17	Change "of" to "or"
45	24	Change the second "that" to "what"
47	20	Change "containments" to "contaminants"
48	5	Change "second" to "site"
50	20	Change "station" to "inhalation"
51	7	Change "thermal" to "dermal"
56	8	Change "acquiring" to "inquiring"
57	15	Change "professor" to "assessor"
58	10	Change the first "of" to "or"
59	8	Change "plum" to "plume"
62	15	Change "sub-slat" to "sub-slab"
62	16	Change "sub-slat" to "sub-slab"
63	3	Change "sub-slat" to "sub-slab"
63	10	Change "sub-slat" to "sub-slab"
65	1	Change "medials" to "chemicals"
65	2	Change "sub-slat" to "sub-slab"
65	8	Change "sub-slat" to "sub-slab"
65	10	Change "Henry" to "Henry's"
65	14	Change "Henry" to "Henry's"
65	16	Change "side" to "site"
65	17	Change "side" to "site"
65	24	Change "voracity" to "porosity"
66	15	Change "sub-slat" to "sub-slab"
67	9	Change "effect" to "affect"
69	10	Change "progress" to "proposed"
73	3	Change "Based" to "Waste"

Respectfully submitted,

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: _____
Kimberly A. Geving
Assistant Counsel
Division of Legal Counsel

Dated: June 8, 2011

1021 N. Grand Ave. East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217) 782-5544

STATE OF ILLINOIS)
)
COUNTY OF SANGAMON)

PROOF OF SERVICE

I, the undersigned, on oath state that I have served the attached Motion to Correct the Transcript upon the persons to whom they are directed, by placing a copy of each in an envelope addressed to:

Dorothy Gunn, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601

Mitchell Cohen
Chief Legal Counsel
Illinois Dept. of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271

Matt Dunn
Environmental Enf./Asbestos
Litigation Division
Illinois Attorney General's Office
69 W. Washington St., 18th Floor
Chicago, Illinois 60602

Richard McGill
Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601

ORIGINAL

Participants on the Service List

and mailing them (First Class Mail) from Springfield, Illinois on June 8, 2011, with sufficient postage affixed as indicated above.

SUBSCRIBED AND SWORN TO BEFORE ME
This 8th day of June, 2011.

Notary Public

"OFFICIAL SEAL"
BRENDA BOEHNER
NOTARY PUBLIC
STATE OF ILLINOIS
MY COMMISSION EXPIRES 11-14-2013

12/7/2010	DCEO / Sec. of State	*Letter from DCEO stating they are unable to undertake an economic impact study	
12/1/2010	Other	*Letter to Director Ribley of DCEO Requesting Economic Impact Study	
12/1/2010	Motion	Agency's Motion for Leave from Filing Requirement	
11/22/2010	Other	*Electronic version of Proposed Amendments submited by the IEPA (see Clerk's Office)	
11/18/2010	Order	Order of the Board by T. E. Johnson: Accept rulemaking proposal for hearing	
11/18/2010	Appearance	Appearance of Alec M. Davis for Illinois Environmental Regulatory Group (electronic filing)	
11/9/2010	Initial Filing	Proposed Amendments (< 4MB, 172 Pages)	
11/9/2010	Initial Filing	Motion for Acceptance; Appearance of Kimberly A. Geving; Certification of Origination; Statement of Reasons; and List of Studies and Reports Used in Regulatory Development	

Service List

Party Name	Address	City/State/Zip	Phone/Fax
IEPA **Petitioner** • Kimberly A.Geving - Assistant Counsel	1021 North Grand Avenue East P.O. Box 19276	Springfield IL 62794-9276	217/782-5544 217/782-9807
Hodge Dwyer & Driver **Complainant** • Katherine D. Hodge • Monica T. Rios	3150 Roland Avenue Post Office Box 5776	Springfield IL 62705-5776	217/523-4900 217/523-4948
Mayer, Brown LLP **Interested Party** • Kevin G.	71 South Wacker Drive	Chicago IL 60606-4637	312/782-0600 312/701-7711

Desharnais			
Sidley Austin LLP **Interested Party** • William G. Dickett	One South Dearborn Suite 900	Chicago IL 60603	312/853-7000 312/853-7036
EPI **Interested Party** • Bob Mankowski	16650 South Canal	South Holland IL 60473	
Illinois Environmental Regulatory Group **Interested Party** • Alec M. Davis	215 East Adams Street	Springfield IL 62701	217/522-5512 217/522-5518
Chemical Industry Council of Illinois **Interested Party** • Lisa Frede	1400 East Touhy Avenue Suite 110	DesPlaines IL 60019-3338	
Bellande & Sargis Law Group, LLP **Interested Party** • Mark Robert Sargis	19 South LaSalle Street Suite 1203	Chicago IL 60603	312/853-8701 312/853-8702
Hanson Engineers, Inc. **Interested Party** • Tracy Lundein	1525 South Sixth Street	Springfield IL 62703-2886	217/788-2450 217/788-2503
Conestoga-Rovers & Associates **Interested Party** • Douglas G. Soutter	8615 West Bryn Mawr Avenue	Chicago IL 60631	773/380-9933 773/380-6421
Office of the Attorney General **Interested Party** • Matthew J. Dunn - Division Chief	Environmental Bureau 69 W. Washington, 18th Floor	Chicago IL 60602	312/814-0660 312/814-2347
Seyfarth Shaw **Interested Party** • Craig B. Simonsen - Paralegal • Phil Comella	131 South Dearborn Street Suite 2400	Chicago IL 60603-5803	312/460-5000 312/460-7000
Navy Facilities and Engineering Command **Interested Party** • Mark Schultz - Regional Environmental Coordinator	201 Decatur Avenue Building 1A	Great Lakes IL 60088-2801	847/688-2600 847/688-2319
Illinois Pollution	100 W.	Chicago	312/814-

Control Board **Interested Party** • - Clerk of the Board • Richard McGill - Hearing Officer	Randolph St. Suite 11-500	IL 60601	3620 312/814-3669
Commonwealth Edison **Interested Party** • Diane H. Richardson	10 South Dearborn Street 35FNW	Chicago IL 60603	
Weaver Boos & Gordon **Interested Party** • Elizabeth Steinhour	2021 Timberbrook Lane	Springfield IL 62702	
Andrews Environmental Engineering **Interested Party** • Kenneth W. Liss	3300 Ginger Creek Drive	Springfield IL 62711	
Missman Stanley & Associates **Interested Party** • John W. Hochwarter • Jeffrey Larson	333 East State Street	Rockford IL 61110-0827	
Trivedi Associates, Inc. **Interested Party** • Chetan Trivedi	2055 Steeplebrook Court	Naperville IL 60565	
Illinois Department of Natural Resources **Interested Party** • Stan Yonkauski • Mitchell Cohen - General Counsel	One Natural Resources Way	Springfield IL 62702-1271	217/782-1809 217/524-9640
Suburban Laboratories, Inc. **Interested Party** • Jarrett Thomas - V.P.	4140 Litt Drive	Hillside IL 60162	708-544-3260
Illinois Department of Transportation **Interested Party** • Steven Gobelman	2300 S. Dirksen Parkway Room 302	Springfield IL 62764	
McGuire Woods LLP **Interested Party** • David Rieser	77 W. Wacker Suite 4100	Chicago IL 60601	312/849-8100

Reott Law Offices, LLC **Interested Party** • Raymond T. Reott • Jorge T. Mihalopoulos	35 East Wacker Drive Suite 650	Chicago IL 60601	312/332-7544
Environmental Management & Technologies, Inc. **Interested Party** • Craig Gocker - President	3010 Gill Street	Bloomington IL 61704	309/661-2300 309661-2306
Chicago Department of Law **Interested Party** • Charles A. King - Assistant Corporation Counsel	30 N. LaSalle Street Suite 900	Chicago IL 60602	312/742-3990 312/744-6798
SRAC **Interested Party** • Harry Walton	2510 Brooks Drive	Decatur IL 62521	
Burns & McDonnell Engineering Company, Inc. **Interested Party** • Lawrence L. Fieber - Principal	210 South Clark Street, Suite 2235 The Clark Adams Building	Chicago IL 60603	6306751625

Total number of participants: 28

Notice List

Party Name	Address	City/State/Zip	Phone/Fax
Drinker Biddle & Reath **Interested Party** • Sheila H. Deely • Stephanie Jackson	191 N. Wacker Drive Suite 3700	Chicago IL 60606-1698	312/569/1000 312/569-3000
Jones, Day, Reavis & Pogue **Interested Party** • LaNail C. Griffin	77 West Wacker Drive	Chicago IL 60601-1692	312/782-3939 312/782-8585
Illinois Power Company **Interested Party** • Brian Martin	500 South 27th Street P.O. Box 511	Decatur IL 62525-1805	217/424-6833
Hinshaw & Culbertson **Interested Party**	416 Main Street 6 th Floor	Peoria IL 61602	309/674-1025 309/674-9328

ORIGINAL

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	
TIERED APPROACH TO CORRECTIVE	)	R11-9
ACTION OBJECTIVES,	)	(Rulemaking-Land)
(35 Ill. Adm. Code 742)	)	
	)	

TRANSCRIPT FROM THE PROCEEDINGS

taken before the HEARING OFFICER RICHARD McGILL by LORI ANN ASAUSKAS, CSR, RPR, a notary public within and for the County of Cook and State of Illinois, in the Sangamon Room at the Illinois Environmental Protection Agency, Springfield, Illinois, on the 29th day of March, 2011, A.D., at 9:00 o'clock a.m.

A P P E A R A N C E S:

ILLINOIS POLLUTION CONTROL BOARD,
100 West Randolph Street
Suite 11-500
Chicago, Illinois 60601
(312) 814-6983
BY: MR. RICHARD McGILL,

ILLINOIS POLLUTION CONTROL BOARD MEMBERS PRESENT:

Mr. Thomas E. Johnson, Board Member
Mr. Anand Rao, Staff Member
Ms. Alisa Liu, Staff Member

ILLINOIS ENVIRONMENT PROTECTIO AGENCY,
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217) 782-5544
BY: MS. KIMBERLY A. GEVING,

A P P E A R A N C E S: (Continued)

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY MEMBERS PRESENT:

Mr. Hernando A. Albarracin
Ms. Valerie Davis
Mr. Greg Dunn
Mr. Andrew Frierdich
Ms. Kimberly A. Geving
Ms. Tracey E. Hurley
Mr. Gary P. King
Ms. Patricia Layman
Ms. Joyce Munie
Ms. Heather N. Nifong
Mr. Mohammed Zillur Rahman

ALSO PRESENT:
Mr. Alec M. Davis
Mr. Raymond T. Reott
Mr. Brian Martin

I N D E X

E X H I B I T S

HEARING OFFICER McGILL: Good morning. I would like to welcome everyone to this Illinois Pollution Control Board hearing in Springfield. My name is Richard McGill. I'm the hearing officer assigned to this rulemaking. The document number is R11-9.

The rulemaking has been captioned Tiered Approach to Corrective Action Objectives, TACO, Indoor Inhalation, Amendments to 35 Illinois Administrative Code 742.

Just some brief background on the proposal. On November 9, 2010, the Board received a rulemaking proposal from the Illinois Environmental Protection Agency to amend the Board's TACO rules in order to add the indoor inhalation exposure route TACO's risk-based methodology.

On November 18, 2010, the Board accepted a proposal for hearing and on the same date, granted IEPA's motion to voluntarily withdraw the first TACO indoor inhalation rulemaking proposal, which had been docketed as R09-9.

Today is the first hearing in this R11-9 rulemaking. Another hearing is scheduled

for May 24 and 25, 2011, in Chicago.

Also present today on behalf of the Board to right is member Tom Johnson, lead Board member for this rulemaking. To my left are members of the Board's technical unit, Anad Rao and Alisa Liu.

Board Member Johnson, would you like to make any remarks at this time?

MR. JOHNSON: No. Thanks for coming. We might as well get started.

HEARING OFFICER McGILL: To make today's hearing as efficient as possible, I issued a hearing officer order on December 8, 2010, directing the filing of any pre-filed testimony, pre-filed questions, and pre-filed answers.

On January 31, 2011, IEPA timely filed its pre-filed testimony. The deadline for participants to pre-file questions for IEPA's witnesses was February 28, 2011, but the Board received no pre-filed questions.

We will begin today by taking up the entering of IEPA's pre-filed testimony into the record as if read as well as accepting hearing exhibits. With its pre-filed testimony,

IEPA included Errata Sheet No. 1.

After we tend to this business, we will turn to questions for IEPA's witnesses who will be responding today as a panel.

On March 24, 2011, I issued a hearing officer order attaching six pages of Board staff questions for IEPA's witnesses. Those questions are organized generally by specific subpart and section within Part 742. For each Board staff question that IEPA is prepared to answer today, we will first read the question aloud for the benefit of the hearing transcript and any other participants present in the audience today.

Anyone, however, may ask questions of IEPA's witnesses and any participants present in the audience will be given the first opportunity to pose their questions before the Board proceeds with its questions. After the testimony of and questions for IEPA's witnesses, we will allow anyone else to testify, time permitting.

For the conclusion of today's hearing, we will also take up the Board's request that the Department of Commerce and Economic

Opportunity perform an economic impact study on this rulemaking proposal.

We have this hearing room reserved for tomorrow if business remains at the end of today. Otherwise, we will conclude this hearing today with a brief discussion of the scheduled Chicago hearing and pre-filed -- pre-filing deadlines for that hearing.

Today's proceedings are governed by the Board's procedural rules. All information that is relevant and not repetitious or privileged will be admitted into the record.

Those with testify will be sworn in and may be asked questions about their testimony. For those who wish to testify, but who did not pre-file their testimony, we have a witness signup sheet located at the back of the room.

For the court reporter transcribing today's proceedings, I would ask that you please speak up and do not speak too quickly or talk over one another. Also, when you speak each time, if you would identify yourself, your position and your organization, if any, you

are representing. All of these measures will allow the Board to have a clear transcript for its consideration.

Are there any questions about our procedures?

Seeing none, I wanted to move on to the pre-filed materials of the IEPA. Absent any objections, the pre-filed testimony of IEPA will be entered into the record as read as provided in my December 8, 2010, hearing officer order. After that, I will take up the designation of IEPA's hearing exhibits.

So first, is there any objection to entering, as if read, any of the pre-filed testimony of Gary King or Tracey Hurley?

Seeing none, it is so entered. I will now take up designating each -- or the pre-filings as hearing exhibits for easier citation later.

First, is there any objection to accepting into the record as a hearing exhibit the pre-filed testimony of Gary King?

Seeing none, that is Hearing Exhibit No. 1.

(Document marked as Hearing Exhibit No. 1 for identification, 3/29/11.)

HEARING OFFICER McGILL: Second, is there any objection to accepting into the record as a hearing exhibit the pre-filed testimony of Tracey Hurley?

Seeing none, that will be Hearing Exhibit No. 2.

(Document marked as Hearing Exhibit No. 2 for identification, 3/29/11.)

HEARING OFFICER McGILL: Lastly, at this point, is there any objection to accepting into the record as a Hearing Exhibit IEPA's Errata Sheet No. 1, which was filed with the Agency's pre-filed testimony?

Seeing none, that will be Hearing Exhibit No. 3.

(Document marked as Hearing Exhibit No. 3 for identification, 3/29/11.)

HEARING OFFICER McGILL: If the court reporter would, please swear in the IEPA panel.

(IEPA panel sworn.)

HEARING OFFICER McGILL: Again, I would like to thank Agency counsel and the Agency's witnesses for all the hard work that went into the proposal. It reflects a tremendous effort and I wanted to say that on the record. Again, thank you for being here.

I would now ask IEPA's attorney, Kim Geving, to begin IEPA's presentation.

MS. GEVING: Good morning. First, I would like to present the Board with two sets of copies of the pre-filed testimony and Errata Sheet No. 1. I have already given the court reporter her copy.

For members of the public, there are additional copies on this right-hand table to my right of our proposal and also all the testimony of Errata Sheet No. 1, if anybody needs that.

So with that, I will introduce the witnesses. To my far left is Dr. Tom Hornshaw, the manager of the Toxicity Assessment Unit. To my immediate left is Tracey Hurley, environmental toxicologist. To my right, immediate right, is Heather Nifong, programs advisor for the Division of Remediation Management. To Heather's right is Gary King, the manager of the Division of Remediation Management. To Gary's right is Joyce Munie, manager of the Remedial Project Management Section. To Joyce's right is Hernando Albarracin, manager of Leaking Underground Storage Tank Section. And to the very far right is Mohammed Rahman, who is a project manager for the Leaking Underground Storage Tank Section.

And with that, I believe Ms. Hurley and Mr. King have summaries of their testimony. So we can proceed with that.

Gary, if you would like to go first?

MR. KING: Yes. My name is Gary King and I'm testifying in support of the Agency's proposal in this matter and, of course, for the record, I'm going to use the term TACO in short for,

you know, Part 742 or Tiered Approach To Corrective Action Objectives.

We received the Board's questions on Thursday and appreciate you doing that for us in writing. I think it -- we obviously have been scrambling around for the last -- last couple days trying to formulate meaningful responses to those and I -- I think we will be able to address those questions. I think we will be able to address them fully. There may be some follow-up that may need to be, you know, thought through as far as for the subsequent hearing.

As everyone is aware, Illinois has had a risk-based methodology for addressing remediation of contaminates in soil and groundwater since 1997. That, of course, we called TACO. As a result of TACO, we have literally been able to remediate thousands of contaminated sites and acres across a broad range of Illinois EPA cleanup programs. We address hundreds of sites each year in reaching closure with regards to those.

When we filed our 2008 rulemaking relative to indoor inhalation, we did that as an addition to TACO, as an additional pathway to be

evaluated and addressed, and I think it's important to think about indoor inhalation as we proposed it as being incorporated into TACO. It's not a stand-alone guidance document. It's not a stand-alone approach. It's incorporated into what we have had and what we use successfully in cleaning up sites in Illinois.

It's important to understand that because there is -- and I thought the Board's questions were good ones about the whole notion of multiple lines of evidence. Because as we incorporated this into TACO, we're not just talking about single points or single lines relative to indoor inhalation.

What we're talking about is incorporating this into the broad framework of what needs to be addressed as the site goes through cleanup and that -- to apply TACO relative to all the pathways requires an extensive knowledge of site conditions, groundwater, soil, source, buildings, the geology of the site and all those are -- all those are factors that go into making up what generally is talked about as multiple lines of evidence.

So that's really an important factor as to the structure of our proposal here and again, different from -- as you see is what USEPA is doing, they are developing indoor inhalation -- excuse me -- and they call it -- they obviously call it vapor intrusion. They are developing that really as a stand-alone kind of thing. They're not incorporating that into an existing regulatory structure because they don't have any regulatory structure for cleanup methodologies.

The same way other states are doing it, they have a stand-alone kind of document. So we're -- we're doing things differently here and I think that really allows us to take advantage what's already existing in the system.

We obviously had hearings in 2009 and then after the close of the hearings, although we did not -- USEPA did not put anything on the record in the context of the previous hearings, they did send us emails and other correspondence indicating they had objections to what had been proposed.

Now, we could have just taken

the approach, I think, that said, well, just continue with the Board proceeding and conclude it, but in thinking through on that, I didn't want to see us end up with a rule adopted and then have a controversy with USEPA as to whether it made sense to implement that.

So we took a step back and looked as their comments in 2009, made additions to our proposed rule, and then in the spring of 2010, we presented that -- those changes to them and then we sat down and had a very extensive meeting in their Chicago offices talking through the totality of what we were doing with our indoor inhalation proposal.

One of the things that was significant in talking to them is they had not understood what all of TACO entailed, I mean, what we were talking about in terms of site investigation in order to make TACO operate.

Once they understood that, they felt -- you could see that they felt much more comfortable about what we were doing. They submitted some comments to us in August of 2010, some pretty specific comments, and we were -- we

turned around and addressed those.

We sent them a letter in October and, you know, we -- they did not come back to us with any kind of written approval as to what we had proposed, but this certainly indicated to us verbally and they certainly understood that we had addressed their concerns that they had raised.

I'm not -- you know, at this point, I'm not aware of any state in the country that has gotten that kind of review from the USEPA in confirmance (sic) of what the state has going forward with.

I think we'll probably get into some of these other things and obviously, in my testimony, I've gone through and dealt with a lot of specific issues. I think -- I think the Board's questions really will allow us to focus on specific aspects of that testimony. So I think I will go ahead and conclude at this point with my opening remarks.

HEARING OFFICER McGILL: Thank you.

MS. GEVING: Ms. Hurley, if you would like to present your summary.

MS. HURLEY: Good morning. My

testimony today concerns the updates to the appendices and Errata Sheet 1.

The four primary reasons for the updates, number one, was we calculated new remediation objections for the indoor inhalation route and along with that, we added two new tables with Tier 1 remediation objectives. That is Appendix B, Table H, and that is to be used when the mechanism of transport is both diffusion and advection.

We added Appendix B, Table I, and that is to be used when the mechanism of transport is diffusion only.

We added a new table with the Johnson and Ettinger model equations used in calculating the Tier 1 indoor inhalation remediation objectives.

We also added a new table with the parameters used in the J&E model. We added Tier 1 soil remediation objectives for the outdoor inhalation route and associated equation S30 was added to Appendix C, Table A.

The second reason for the revisions was we added new chemicals from the

proposed groundwater standards.

Number three, the Tier 1 remediation objectives were calculated using updated toxicity values, which are listed on Illinois EPA's website and the URL for the website is given in my pre-filed testimony and also on Appendix C, Table B.

And the fourth reason were the Tier 1 remediation objectives were calculated with updated fiscal and chemical parameters listed in Appendix C, Table E, and the errata one pages were discussed in my pre-filed testimony.

And that concludes my summary.

HEARING OFFICER McGILL: Thank you.

MS. HURLEY: Oh, and I have been asked to add that the proposed groundwater amendments are in R08-18. Thank you.

MS. GEVING: That concludes our summaries and we are ready for questions.

HEARING OFFICER McGILL: All right. Why don't we go off the record for a moment.

(Whereupon, a discussion was had off the record.)

HEARING OFFICER McGILL: Why don't we

go back on the record?

We're going to now move into the questioning portion of the hearing with IEPA's witnesses. As I mentioned earlier, I issued a hearing officer order with Board staff questions. We will be moving through those that are organized by -- to begin with, questions based on USEPA guidance and then move through the subparts of the proposal.

Members of the public may ask questions before or in connection with our questioning or after. So with that, I want to open it up to the public to see if any member of the public has any question for any of the Agency's witnesses as this time.

Seeing none, the Board will move ahead with its questions. We will begin with questions on Part 742 based on USEPA guidance and again, these are Board staff questions that are an attachment to the March 24, 2011, hearing officer order.

MR. RAO: Okay. I'm going to start with the first question. According to USEPA's "Review of the Draft 2002 Subsurface Vapor Intrusion

Guidance," EPA 530-D-02-004, posted August 30, 2010, (OSWER review document or ORD), USEPA expects to issue final guidance by November 2012. Please comment on how IEPA anticipates that it would go about considering both the final guidance and whether the final guidance warrants an additional rulemaking before the Board.

MR. KING: Well, the key, I think, in looking at -- going to be in looking at the guidance document if it does, in fact, come out in 2010 or at some later date is whether there is going to be information included in that guidance document that indicates that there is an inconsistency with the information that we used when we developed our proposal.

We used the EPA User's Guide quite a bit in developing our proposal because it had a lot of good information in there. So the fact that there may be some sweeping statements or sweeping conclusions in an EPA guidance document, I don't think is going to be particularly influential as to whether we looked at change -- looked to an amended proposal.

I mean, we have taken a different

approach to developing attenuation factors than what EPA has because they're looking at -- and then Tracey is going to talk about that in response to the next question, but they have looked at national factors. I mean, they have looked at a national database.

We've tried to be specific on chemicals and specific on soil types in developing our approach on attenuation factors so that would be an example on that.

MR. RAO: In your interactions with the USEPA, you mentioned earlier you had discussions and review of the proposal that we have before the Board. Was there any indication from the USEPA for you to wait until this document comes out in the final guidance or they were happy with what was given to them in terms of addressing their concerns?

MR. KING: That was -- when we had the meetings, they had not -- the -- at the time we met with them in May of 2010, the inspector general audit was out, but the EPA response was not out, but we had gotten some idea that they were -- at that point they were talking about a late 2012 guidance document.

We indicated we thought it was important for the state to continue to proceed to put something in place and they certainly did not raise any objection or any indication that they thought we should hold off in what we were doing.

MR. RAO: Okay.

MS. LIU: Mr. King, would you briefly respond on why it's important to move ahead now rather than to wait for that final guidance?

MR. KING: Yes. As I was saying earlier, we are addressing hundreds of sites on an annual basis and the longer that we wait, the longer this issue is left unaddressed at -- relative to site-specific cleanups.

You know, for some people, they may think that's a good thing, you know, don't address it at all, but we have felt it's more appropriate to just -- to put a process in place that will allow this pathway to be addressed and allow liability issues with regards to this pathway to be resolved.

MS. LIU: Is the Agency holding

up on issuing NFR letters until this rulemaking is adopted or are you continuing to issue NFR letters?

MR. KING: Continuing to issue NFR letters in accordance with the existing in effect Board rules.

MS. LIU: The OSWER review document discusses generic attenuation factors.

HEARING OFFICER McGILL: Can I just interrupt for just one second?

MS. LIU: Sure.

HEARING OFFICER McGILL: Let's just indicate our question number in case somebody is following at home in the transcript so we're asking -- as you can see, we'll have some follow-up questions to our Board staff questions from the hearing officer order. So we are now moving on to Question 2. Sorry for the interruption.

MS. LIU: Question 2, The OSWER review document discusses "generic" attenuation factors used in the draft 2002 USEPA guidance and the need for these to be updated. ORD at 3. Please identify the sources of the attenuation factors used by IEPA to calculate the proposed

default Tier 1 remediation objectives and why those sources are appropriate.

MS. HURLEY: As Gary stated briefly, the TACO proposal does not have generic attenuation factors in the same way that USEPA's proposal does. We use the Johnson and Ettinger model and the equations are listed in our proposal and we used Illinois soil-specific parameter values and chemical-specific parameters to determine chemical-specific attenuation values that we thought were more relevant to Illinois than a generic nationwide approach.

And USEPA -- they have a database on empirical studies of attenuation factors, but it is a draft preliminary document and it's not acceptable as a viable technical source in the rulemaking.

MS. LIU: The next question is No. 3 and it begins discussing the generic attenuation factors from that database, but since you indicated that you didn't use those, the rest of the question is still worth asking so I will proceed.

The 2002 draft USEPA guidance

indicates that multiple lines of evidence approach would provide greater certainty and it appears that IEPA's proposed approach only requires multiple lines of evidence. In other words, the requirement to meet both soil and soil gas and groundwater remediation objectives versus meeting only one or the other when the mode of transport is diffusion only.

In other words, when the soil and groundwater contamination is more than five feet from an existing or potential building or man-made pathway. This refers to the proposed sections at 742.515(a) through (d).

Given the source of the attenuation factors that IEPA did rely on, please comment on whether the multiple lines of evidence approach should be used when the mode of transport is "diffusion and advection," not just "diffusion only."

MR. KING: Let me comment on that. I guess we've reached the conclusion that we think we are using multiple lines of evidence on both the diffusion only and diffusion and advection. That goes back to the concepts I was talking about

in my initial statement and that is the fact that this proposal should be viewed in the context of the entire process of remediation and vision under TACO.

If you go to various documents that talk about what multiple lines of evidence includes, there's a number of things that are included. Some people just think, well, you either -- you do groundwater, soil gas or indoor air and those are the only lines of evidence, but that's not what really what the research has been looking at.

I'll just go through it. Here's what I have seen in the literature relative to lines of evidence and this is in no particular order; source of the contaminants, soil gas data, groundwater data, background data from indoor and outdoor sources, building construction and current conditions including utility conduits, sub-slab or crawl space, soil gas data, indoor air data, concurrent outdoor air data, data trends, site geology, results of fate and transport modeling, risks of -- excuse me -- results of the risk assessment and site or building ownership and

control.

And it would be apparent that you don't have to look at all of those on any given site to reach a conclusion that you have multiple lines of evidence or that the remediation decisions have been proper.

In Illinois, the existing remediation programs have placed great emphasis on rigorous requirements for site characterization, including site geology, depths in movement of groundwater and contaminant movement, historical and predicted through the environment.

Accurate characterization of site conditions and contamination released to the environment are the most important lines of evidence in determining indoor inhalation risks. These lines of evidence are addressed at all sites under TACO. As a result, we always have multiple lines of evidence as to whether an indoor inhalation pathway may be complete.

Under our proposal, indoor inhalation is not a stand-alone evaluation, but it has been incorporated into TACO so it can be used in conjunction with all the elements that

we already use in site cleanup.

MS. NIFONG: To add a point of clarification, the list that Gary referenced comes directly from one of our other studies and reports and I wanted to provide the source for that. It's the Tri-Service Environmental Risk Assessment Work Group, which is comprised of the U.S. Air Force, U.S. Navy and U.S. Army and is dated 2008 and that is one the source documents used by USEPA in its review document.

MS. LIU: Would you happen to have a copy?

MS. NIFONG: At my desk.

MS. GEVING: We can provide that at the next hearing.

MS. NIFONG: We can provide that.

MS. LIU: Could you do it before the second?

MS. GEVING: If we have a break today. Is it a long document?

MS. NIFONG: It's a long document.

HEARING OFFICER McGILL: It could be included in the pre-filed testimony for the second hearing --

MS. NIFONG: Okay.

HEARING OFFICER McGILL: -- so we have it in advance.

MS. NIFONG: The URL for the document is a PDF file and it is also contained in our list of other studies and reports.

HEARING OFFICER McGILL: Oh, in the original report provided by the IEPA?

MS. NIFONG: No, in November proposal.

HEARING OFFICER McGILL: Okay. It's listed among your studies --

MS. NIFONG: Right.

HEARING OFFICER McGILL: -- and reports relied upon?

MS. NIFONG: Right.

HEARING OFFICER McGILL: Okay.

MS. NIFONG: That's right.

HEARING OFFICER McGILL: Thank you.

MS. LIU: On the list that you did refer to, many of those factors, as I understand it, are used to plug into the J&E model when you want to do a site-specific model evaluation.

But according to the OSWER review document, this is Question No. 4, even

when attenuation factors are calculated, using a semi-site-specific model and combined with either groundwater or soil gas data, this constitutes only a single line of evidence. ORD at 3-4. The OSWER review document further indicates that although this approach may be sufficiently protective for site screening based on groundwater data, the same generally appears not to hold true for reliance on soil gas data. It appears that proposed Section 742.515(c) under Tier 1 would allow compliance to be determined using soil gas data and a calculated attenuation factor. It also appears that proposed Section 742.600(f) under Tier 2 would allow compliance to be determined using soil gas data and a calculated attenuation factor.

The question is to please comment on whether the determination of compliance under what appears to be a single line of evidence approach should be limited to groundwater data, (not soil gas data) or if a multiple lines of evidence approach should be used when the mode of transport is "diffusion and advection," not just "diffusion only."

MR. KING: Well, I'm not sure I

have too much to add to what was previously said. I think to some extent to just talk about whether something is good or bad because it's single or multiple doesn't really get to the heart of things. I mean, whether it's single or multiple, however you want to characterize it, the issue becomes whether what is being proposed is logical and makes sense and is going to address the risks involved.

So, I mean, we had a -- we developed a methodology relative to why we used the compliance approach that we had. We developed that methodology and we went over it with USEPA, Region 5, and they found it acceptable methodology regardless of whether you call it single line or multiple line.

I mean, that was the methodology that we presented. That was the methodology they concluded was acceptable. I think the methodology that we have in the rule makes logical sense consistent with the information that has been developed.

MS. LIU: From a practical perspective, from the perspective of the regulated

community, as you indicated, they are already sampling the soil, the groundwater and the soil gas.

How much more difficult would it be to require compliance be demonstrated on the soil gas sample and the groundwater or just the groundwater sample along with the sample along with the model in the way that you proposed it?

MR. KING: Well, they are not always collecting soil gas. Okay? And everybody is going to be collecting groundwater data because that's what's there now.

The issue became for us when do you require both and when would you require either one? You know, so that's -- I guess that's just kind of the logic we went through. Soil gas is not universally taken at this point.

MS. LIU: Well, along the lines of USEPA's concerns for not relying on soil gas data, would it be a practical step to just limit it to groundwater data if you are going to use single line evidence approach rather than groundwater or soil gas, just groundwater?

MR. KING: Well, before I respond to that, let me -- can we just take a little bit of time to think through on that so what you are really suggesting is that where we specify soil gas or groundwater, it would be better -- at least one thing to consider would be to just have groundwater?

MS. LIU: Yes. That was the feeling I got from the OSWER review documents.

MR. KING: Okay. All right. Well, let's think that through and I think that's a fair question. So...

MS. LIU: Thank you.

HEARING OFFICER McGILL: Okay. Just one follow-up from me. This aspect of IEPA's proposal was presented to the USEPA and they didn't object to this being a single line of evidence approach?

MR. KING: This was presented to them and they did not object to it, that's correct. But again, you know, if there is a way to structure the rule better and they could make it more practical and have it make more sense, then, the fact that a year ago they gave us an approval on it, I don't

think should stop further evaluation of what's proposed.

HEARING OFFICER McGILL: Sure. Do you think this is a -- I don't want to get hung up on multiple versus single, but do you think that what IEPA has proposed here that USEPA would consider the multiple line of evidence approach, as you're suggesting, or is the OSWER review document defining what a multiple line of evidence is differently than what you are?

MR. KING: Well, all I can say to that is when we talked to them, we presented what we had. The concept of multiple lines of evidence had been put forth by the Office of Inspector General. EPA was saying that they were going to concur with that kind of approach, you know, so they were indicating that they liked that use of that terminology and at the same time, they were saying that our proposal was acceptable. So I don't know what kind of conclusion to draw from that.

HEARING OFFICER McGILL: Okay.

MR. RAO: I have a follow-up question, not directly related to this, but this is about the

outdoor inhalation exposure issue where your proposal gives a choice between remediation objectives based on soil gas or soil.

Do you have any idea about how those remediation objectives compare if you use soil gas versus inhalation of remediation objectives versus soil?

MR. KING: Well...

MR. RAO: Or what would be the Agency's preference, in other words, to have data for both soil and soil gas or which remediation objectives?

MR. KING: Well, we -- I mean, the way we had it presented, it would be -- it would be either one relative to the outdoor inhalation route. We didn't feel it was appropriate to abandon the soil remediation objectives concept that we've had in the rules for almost 15 years. I mean, it's worked effectively. We have not seen a real problem using that approach.

The way we looked at it is if we were going to add that soil gas on as an alternative for indoor inhalation, that that would also be appropriate to add it in for outdoor

inhalation, but I sense the question coming to us was -- is should also -- should that be the way you do things so...

MR. RAO: Yes. I just wanted to get a feeling as to what the Agency thinks in terms of data that is available for both.

MR. KING: If the data -- the way we had it set up is if you meet either the soil number or the soil gas number relative to the outdoor inhalation pathway, that would be -- represent compliance.

MR. RAO: Either one?

MR. KING: Either one.

MR. RAO: Okay. So the question was, you know, if the data is available, they determine the remediation objectives of both and there is a significant difference between the remediation objectives, would that still be acceptable if they go with the remediation objective which is much higher than -- one higher than the other?

MR. KING: We were trying to have something that was equally protective. So I don't know. I mean --

MR. RAO: That's what I was trying

to get at, whether they were equally protective and, you know, do you have data that shows that remediation objectives are based on soil gas or soil and are equally protective.

MR. KING: You know, I don't think we did a directive comparison to the two. I mean, what -- the logic of what we are doing was that if you -- we were going to add soil gas objectives as a methodology for determining compliance with indoor air requirements, that it -- that should be also allowed to be used for outdoor as well because if somebody is taking data relative to soil gas, they should be able to use it relative to either context, just the objectives might be different. We didn't try to do a comparison between soil gas and soil, but we believe they are equally protected.

MR. RAO: Okay.

MS. NIFONG: The equations for both come from the SSL model and so the input parameters we used were consistent with what we have in existing TACO Tier 1.

MR. RAO: Okay. Because, yeah, I was thinking just like Gary was thinking here, we have this program for objectives based on 15 years worth

of limitation and now, we are bringing in soil gas. So I just want to get an idea as to what it means in terms of coming up with this new way of implementing elimination testing.

MS. HURLEY: I just wanted to add that it's based on equilibrium with relationship between the soil gas and the soil concentration so they should be equally protective.

MR. RAO: Okay. Thanks.

HEARING OFFICER McGILL: So recognizing, then, that it sounds like you're saying one isn't more stringent than the other; is that fair to say?

MS. NIFONG: Yes.

HEARING OFFICER McGILL: Is it conceivable that one would call for remediation and one wouldn't? I mean, would that -- if you're looking at soil gas data and soil data and you're not meeting a soil remediation objective, but you're meeting a soil gas remediation, I guess --

MR. KING: Well, yes, of course that could happen. You could have a situation where you had contaminated soil that's overlain by very tight clay that when you come -- when you go to look at

the soil gas, you know, there's not much being released from the contaminant source up and moving up through the vadose zone to where you are making the soil gas measurement.

So, yes, there could be a difference, but at that point, the soil gas number should be more representative of the risk to individuals -- outdoor individuals at the site.

HEARING OFFICER McGILL: Assuming it's not going to be disturbed; soil, I mean. Is that --

MR. KING: Right, yes. I mean, and that all comes to the institutional controls and those kind of things, which is again part of our TACO process.

HEARING OFFICER McGILL: Okay. Moving on to Question 5, Both the draft 2002 USEPA guidance, that's at Pages 9, 11 and 12, and the OSWER review document at Page 5, recognizes the concern for background contamination in indoor air, as expressed by IEPA, and Mr. King's pre-filed testimony at Page 15.

Nevertheless, when a site

exceeds screening values, the draft 2002 USEPA guidance suggests that it may be appropriate to collect indoor air samples under USEPA's "Tier 3" Site-Specific Pathway Assessment. That's a draft at 38 as well as Pages 7, 8 and 13.

The OSWER review document indicates that USEPA is compiling data to "support the conclusion that many of the chemicals present in the subsurface at vapor intrusion sites are not expected to be present at concentrations of concern in indoor or outdoor air." OSWER review document at five.

The OSWER review document also indicates that the final USEPA guidance may include updates with more specific methodologies for evaluating and making decisions with regard to indoor air sampling. OSWER review document at five.

IEPA notes its continued rejection of using indoor air data as a general method to demonstrate compliance with remediation objectives under Tier 1 or 2, adding that the proposed rules "do not prohibit use of indoor data; however, any

such request would be a Tier 3 evaluation." That's Mr. King's pre-filed testimony at Page 15, citing proposed Section 742.935(a).

The first question, that's our Question 5 (a), Recognizing that the draft 2002 USEPA guidance is proposed to be incorporated by reference, would it be more consistent with that guidance and the OSWER review document to also include an indoor air sampling provision in the rule language of this proposal?

MR. KING: As you indicated, we have been strongly opposed to including indoor air under -- either as a tier set of Tier 1 tables or part of the Tier 2 equations. We've just been opposed to that because the opportunities for background concentrations in a structure that have nothing related to contamination that could be entering the structure from a contaminant source outside the structure and there are contaminants that are not typically found inside a structure, as you indicated, but there are contaminants that are typically found within buildings that are also volatile chemicals.

A couple of those are real

drivers relative to IEPA program activities; one of them is benzene and the other is PCE, both of which have extensive numbers -- there are extensive numbers of products that contain those contaminants that would be -- could be typically found within a structure.

If you include indoor air provisions under Tier 1 or Tier 2, we are very concerned that you would be chasing many false positives and driving the costs of investigation far higher than what need to be to address this pathway.

HEARING OFFICER McGILL: Question 5 (b) was Please comment on how IEPA might include such a provision.

I take it from your remarks that it would not come in Tier 1 or 2; is that fair to say?

MR. KING: Yes, that's correct.

HEARING OFFICER McGILL: Is there any expressed explicit language in Tier 3 recognizing indoor air sampling as a viable approach?

MR. KING: I don't -- I was looking back through there. I didn't see that specifically

in there, but it is something that we would look at under Tier 3.

HEARING OFFICER McGILL: Do you see any merit in having it mentioned specifically in Tier 3 or down sides to doing that?

MR. KING: We could consider doing that. However, the issue then becomes how much then needs to be laid out in the rule as to the site-specifics of what you're to look at when you're going inside a structure and evaluating it for indoor air.

There is a series of checklists that need to be looked at as far as products within it that generally appear within a building. There certainly are issues about removing those products and how long you have to wait before those products are removed from the structure.

You know, you have to be concerned then about the -- how the building is functioning in terms of taking air within the building, pushing it beneath the slab, and then the air is coming back into the building when it's in a negative ventilation mode.

So, yes, we could -- I suppose

we could put a couple of words in there, but as long as we're not, you know, expected to try then to look at all the variables that you'd have to think about in terms of a Tier 3 approach on indoor air, you know, that would be a question.

I mean, if the Board is really thinking that we should go that route and then try to provide some guidance on those variables, that would be extremely difficult to do.

HEARING OFFICER McGILL: Okay.

MR. KING: That's why we -- that's why we placed it in Tier 3 because that is really very much a -- a site-specific review of a site.

HEARING OFFICER McGILL: So you think if you were to say anything, it would be just to note that that can be proposed as opposed to laying out a prescriptive approach to how to do it?

MR. KING: If we were going to do it, that would be my preference.

MS. HURLEY: I just wanted to add that Tier 3 can encompass a lot of issues or options that are not in Tiers 1 and 2 and we don't list all of those options available under Tier 3 either.

HEARING OFFICER McGILL: Yes, yes. I'm just wondering whether this is sufficiently new that it would merit mention obviously not to exclude anything that might otherwise be proposed to a risk assessment, but it's worth considering.

MR. KING: Okay.

HEARING OFFICER McGILL: Question 5 (c), Did USEPA express any concern with IEPA over the absence of such an indoor air sampling provision in this or the now withdrawn R09-9 proposal?

MR. KING: The answer is no.

HEARING OFFICER McGILL: Five (d), Has IEPA investigated whether any other states have rules or guidance that include an indoor air sampling provision?

MR. KING: Yes. There are states that do include indoor air sampling and some states have a very strong emphasis on that as an approach.

HEARING OFFICER McGILL: Have you looked into how they've gotten passed these issues and background concerns?

MR. KING: It's been extremely difficult and, I mean, that's the problem. We've looked at it. It ends up causing a very chaotic

situation for the regulated community within those states as to how to address those issues.

HEARING OFFICER McGILL: Do you recall which states are an example of that?

MR. KING: Two states that I recall would be New York and New Jersey.

MS. HURLEY: I recall that Minnesota and California also have provisions for indoor air sampling, but it's a last step, if necessary, so that the groundwater and soil gas and soil and site should be characterized first and then indoor air sampling would be the last step.

MS. LIU: Is that last step part of the compliance determination?

MS. HURLEY: I do not recall that.

MS. LIU: Since you do remember some of the states that already have things on their books to address indoor air sampling, would that be something that you could do a little research on and provide pertinent sections for us as to whether or not that may or may not be something that would work in Illinois?

MR. KING: We could look at that. And again, those are guidance situations. A lot

of states do very extensive guidance documents relative to these kind of things, which in Illinois, we don't do that. We do things in a rulemaking structure. So that's why we have to be more precise in the things we are saying.

HEARING OFFICER McGILL: Right.

MR. JOHNSON: They let me ask the single sentence questions that apparently are the only ones that have already been answered. So the guidance document that you were referring to earlier, you anticipate that sometime in 2012?

HEARING OFFICER McGILL: 2012 is the USEPA guidance document, but I think IEPA's proposal mentions --

MR. RAO: -- their own.

HEARING OFFICER McGILL: -- an IEPA guidance document being prepared.

MR. JOHNSON: So Question 6, What is the status of that, Gary?

MR. KING: Okay. Well, that was a little bit of a goof up in our statement of reasons. We've got a -- we carried over a paragraph that we really did -- we really should not have carried over from our original statement of reasons.

We are not planning on issuing a guidance document. What we envision doing is to issue site -- to have issue-specific fact sheets to be prepared as they are needed. For example, a fact sheet presenting a soil gas sampling protocol may be developed and posted.

That's what we've done with existing TACO rules as we've seen issues come up that warranted doing a fact sheet to provide further clarification on what the Board rule says. That's the way we've approached it. So we're not going to have a general guidance document.

HEARING OFFICER McGILL: Are those fact sheets posted on the IEPA website?

MR. KING: Yes, they are.

HEARING OFFICER McGILL: Okay. We have come to the end of our questions based on USEPA guidance. Does anyone else have any questions related to USEPA guidance for IEPA witnesses?

Seeing none, we will -- why don't we go off the record for a moment?

(Whereupon, a discussion

was had off the record.)

HEARING OFFICER McGILL: Why don't we go back on the record?

We will move on with the Board staff questions relating to Subpart A with TACO which is entitled, "Subpart A: Introduction."

MR. RAO: Question 1, Section 742.105, Subsection (i). The second sentence of proposed Subsection (i) indicates that an evaluation of the indoor inhalation exposure route under Part 742 "does not evaluate the safety of protectiveness of buildings." The sentence appears to be inconsistent with the development of remediation objectives under Tiers 2 or 3 that can rely on site-specific building parameters.

IEPA's pre-filed testimony discusses the proposed language in narrower terms: "The proposal does not address whether contamination within the building, either in the building structure itself or in products within the building, may be creating human health risks." Pre-filed testimony, King at 3.

Should proposed Section 742.105(i)

be refined to more clearly reflect the concept in Mr. King's pre-filed testimony and to address the apparent inconsistency described above?

MR. KING: I take it you like the statement in the testimony better than the more generic statement in the rule itself?

MR. RAO: Yes.

MR. KING: So we were playing around with some language that would address that concern, but we were trying to be a little more generic than what was in the rule than what was -- and I described those as examples, but perhaps it would be a better statement the way you're suggesting.

MR. RAO: We like what you had in your testimony better.

MR. KING: Okay. All right.

MR. RAO: Thank you.

MS. LIU: Question 2, in Section 742.115, Please explain how the indoor inhalation exposure route is comprised of a soil gas component and a groundwater component (proposed Section 742.115(a)(5)) but then provision appears to be made for establishing soil remediation objectives for the indoor inhalation route pursuant to Tier 3 (proposed

Section 742.935(d)).

MR. KING: Well, here's the way we kind of thought that through. Volatile chemicals can migrate from groundwater through soil gas to indoor air. Volatile chemicals can also migrate from soil through soil gas to indoor air.

Although we concluded that it was not appropriate to establish soil remediation objectives under Tier 1 or Tier 2 at this time, at some point in the future it may be feasible to demonstrate site-specific soil remediation objectives.

So we included -- I mean, we kept that as an option and that was in part, when we had discussions with the Site Remediation Advisory Committee and told them we were taking out Tier 1 numbers for soil remediation objectives, they were concerned that there was not any alternative to look at this concept. So we said, well, we'll include something under Tier 3 as an additional way to proceed.

HEARING OFFICER McGILL: Anyone else have any questions regarding Subpart A?

Seeing none, we will move on

to questions -- the Board staff questions on Subpart B, which is entitled, General.

MR. JOHNSON: Section 742.200 under Definitions, The proposed definition of "building" refers to a man-made structure that, among other things, "is intended for or supports any human occupancy for more than six consecutive months."

Is the choice of that time period of six consecutive months based on any assumptions about human exposures to vapor intrusion?

MR. KING: It's not based on assumptions concerning exposures. It was -- we used six months -- well, we initially tried to find an engineering -- some kind of standard engineering or construction definition of a building and we didn't -- we didn't find one. You can go in the dictionary and you can find a definition of a building, but that's not really useful.

As a result, we put together a definition that we thought would make sense in terms of potential human occupancy. So we picked six months as a reasonable time frame that would

indicate an intention of a permanency to the structure.

I mean, for instance, when we initially were putting together a definition, we got -- we received questions about, well, if you have a tent on a site, maybe that could be considered a building. Well, we wanted to get away from that. We wanted to have a sense of permanent -- a potential for permanent occupancy.

So, you know, is six months the right number? We thought it was a reasonable number. It could be less, it could be more, but we thought it was a reasonable choice as far as an indication of intention for permanent -- potential permanent occupancy.

MR. JOHNSON: So then an extension of that is your summer residence on the shores of Lake Michigan then that you're only occupying three months out of the year, Gary, going to be subject to this?

MR. KING: Yes, it would be.

MR. JOHNSON: Okay.

MR. KING: Because that's -- that

would a structure that's capable of being occupied for longer than six months.

MR. JOHNSON: Capable?

MR. KING: Capable.

MR. JOHNSON: And whose intent controls the intended for language?

MR. KING: That's something that we would be making a decision -- decision on relative to when something is proposed. I mean, that's kind of our obligation.

MR. JOHNSON: Finally, does the determination of whether a structure "supports" human occupancy depend upon whether the structure is actually occupied or just fit for occupancy?

MR. KING: Fit for occupancy.

MR. JOHNSON: Fit. Thanks.

HEARING OFFICER McGILL: Question 2, Section 742.210, Incorporations by Reference, 2 (a), Should the OSWER review document be incorporated by reference? I'm referring to the August 2010 USEPA document.

MR. KING: We did not include that because we didn't see that as providing any independent information that we had used in

developing our proposal. So that's...

MS. LIU: Mr. King, as we had discussed just earlier about the multiple lines of evidence approach, if the Agency does consider whether or not to allow just groundwater rather than soil gas or groundwater, would this be a reasonable document to include as an incorporation by reference since that idea does come from there?

MR. KING: Well, we can think about that, but I don't -- I guess I wouldn't jump to that conclusion because again, as we talked about, whether you call something a single line or multiple line, the issue is one of logic and information that comes out of that.

I mean, if we -- if the conclusion is that we're just going to use groundwater as opposed to soil gas or groundwater, we're going to do that not because of this -- the notion of single line of evidence or multiple of evidence. We're going to do that because that makes more -- better sense in the context of the proposal.

So I mean, that's something we can look at, but I don't know that we would

automatically want to include that as a reference document.

HEARING OFFICER McGILL: You know, as we've been referring to this OSWER review document so often, it would probably make sense to make it a hearing exhibit. It would make it easier to cite.

So I'm going to move to go ahead and make that OSWER review document Hearing Exhibit 4. Is there any objection to doing so?

Seeing none, OSWER review document will be Hearing Exhibit 4. Formally, we will let it into the record.

MS. GEVING: Do you need a copy?

HEARING OFFICER McGILL: I'll take one if you have an extra copy.

(Document marked as Hearing Exhibit No. 4 for identification, 3/29/11.)

HEARING OFFICER McGILL: Okay. Question 2 (b), Should ATSDR "Minimal Risk Levels" reflect a date of November 2007 as in the document filed by IEPA rather than December 2006 as in the

proposed ruling?

MS. HURLEY: It should be December 2007 and we will correct that in this -- what are we on -- errata two.

HEARING OFFICER McGILL: Question 2 (c), Was ASTM E2600-08 approved on March 1, 2008, as indicated in the document filed by IEPA, rather than March 7, 2008, as indicated in the proposed rule language?

MS. HURLEY: It should be March 1, 2008, and we will also correct this in errata two.

HEARING OFFICER McGILL: Thank you.

MR. RAO: This was not part of the pre-filed questions, but would it be possible for the Agency to take a look at ASTM E2121-03, Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings approved February 10, 2003? It seems that a more recent edition has been approved by ASTM.

MS. HURLEY: What was that number again, please?

MR. RAO: It is ASTM E2121-03.

MS. NIFONG: What was the date?

MR. RAO: I think it's 2009, there

was -- the one that you have proposed here is from 2003.

MS. NIFONG: Right.

MS. HURLEY: We can look into that.

MR. RAO: Yes.

HEARING OFFICER McGILL: We will move on to Question 2 (d). Is "PAHs in Surface Soil in Illinois" dated 2003 as indicated in the document filed by IEPA, rather than 2004, as indicated in the proposed rule language?

MS. HURLEY: It's a 2004 document.

HEARING OFFICER McGILL: There is a follow-up question to that as well, but that's the first part of it.

MS. HURLEY: Okay. We presented you previously with a 2003 document, but we want to present you with a 2004 document.

HEARING OFFICER McGILL: Okay.

MS. HURLEY: I think I'm answering both of your questions at once.

HEARING OFFICER McGILL: It sounds like the rule language should be 2004 and you'll present us with a 2004 version of this document. I don't know if you have it.

MS. GEVING: I have one copy.

HEARING OFFICER McGILL: Why don't you just include the multiple copies with the pre-filed testimony.

MS. GEVING: Okay.

HEARING OFFICER McGILL: Thanks. The follow-up with to that, I think, you will be able to answer it just by looking at the new document, but the version which was previously provided to the Board lacked identifying references to "We Energies, Milwaukee" and "IEPA" as indicated proposed rule language. Are those entities now reflected on this new document?

MS. HURLEY: They are, they are.

HEARING OFFICER McGILL: Thank you.

MS. HURLEY: The previous document was a final, but it was an internal final version and this is the final publicly available document 2004 that we are providing you.

HEARING OFFICER McGILL: Thank you.

MS. GEVING: Did you want three total copies or four?

HEARING OFFICER McGILL: Four since it will be the first time that we are seeing that

one, please.

Questions 2 (e), The "Technical Background Document for Draft Soil Screening Level Framework Review Draft" filed by IEPA lacks the identifying EPA number and date suggested by the proposed rule language for the USEPA document. I don't know if you have a version of it that has that.

MS. NIFONG: We do have a version that has the correct citations on it. We need to provide you with a second copy and we will try to do that today.

HEARING OFFICER McGILL: Okay. And again, you can just include it with the pre-filed testimony.

MS. GEVING: This document is 447 pages long so do we need to -- how many copies on this one?

HEARING OFFICER McGILL: Two. We have to have at least two for --

MS. GEVING: Two total. Perfect.

HEARING OFFICER McGILL: -- to incorporate them for reference purposes and then one for the rulemaking record. So if there is

no objection to letting the Agency file your copies?

Seeing none, two will be fine. Generally, on voluminous documents, we have been granting motions to allow fewer than ten and typically four, but if this one is especially large, two will be fine.

MS. GEVING: And I apologize. I thought I had done that motion in previous filings, but that might have been an oversight on my part.

HEARING OFFICER McGILL: That's not a problem. Okay. That concludes Question 2.

MS. LIU: Question three, Section 742.227, (a), Please explain the rationale for using "at least three feet below ground surface" in proposed subsection (d) as the location for collecting soil gas concentrations to compare with soil gas remediation objectives.

MR. KING: Samples taken less than three feet from the ground surface can be compromised by the influence of barometric pressure fluctuations that may cause an influx of ambient air into the soil, variations of ambient temperature and precipitation.

The three-foot depth that we use was based on looking at the literature as to this value and we have included -- we included references to a couple of those studies in our list of studies in reports used in regulatory development. The two studies are -- the author is Hartman and one was from 2002 and the one is from 2004, same author.

HEARING OFFICER McGILL: Those are in your list of studies and reports relied upon?

MR. KING: Yes, that's correct.

HEARING OFFICER McGILL: Thank you.

MS. NIFONG: There's an additional document and we need to cross-check because we may have omitted it and it may need to be part of errata two, but it's an API, American Petroleum Institute document, dated 2005, and it's titled, "Collecting and Interpreting Soil Gas Samples from the Vadose Zone." It specifically references the three-foot system. That's on Page 35 of the report.

HEARING OFFICER McGILL: Okay.

MS. LIU: Was that one that was included in your list of studies?

MS. NIFONG: I think we included in

our initial filing in our list of other studies and reports in 2008 and we neglected to carry it over in this -- yeah. I don't have it with me to look it up, but I -- because the date of 2005, I think it was part of that 2008 proposal.

HEARING OFFICER McGILL: If you have it, just give us a reference to that in your pre-file before the second hearing.

MS. NIFONG: Yes.

MS. LIU: Question (b), IEPA states that proposed Section 742.227 "applies to exterior samples collected near the building," in contrast to "sub-slab samples collected directly beneath a building foundation." Pre-filed testimony by King at 22.

Question (b-1), would it merit adding language to proposed Section 742.227 to clarify this distinction?

MR. KING: Yes, it would. We'll make that change as far as the next errata that we propose.

MS. LIU: Question 2 (b), Is sub-slab sampling for the soil gas indoor inhalation exposure route only available pursuant to Tier 3, proposed

Section 742.935(c)?

MR. KING: Yes, that's correct.

MS. LIU: Question (b-3), When IEPA pre-filed testimony refers to "exterior samples collected near the building" in discussing proposed Section 742.227, is IEPA referring only to the indoor inhalation exposure route?

MR. KING: In the testimony statement, that is correct. However, Section 742.227 does apply to both indoor and outdoor inhalation exposure routes.

HEARING OFFICER McGILL: I have a follow-up question and it's based on the OSWER review document at Page 6 of that document. USEPA talks about representative on a multi building site. I'll just read this example.

USEPA says observations have shown that adjacent buildings overlying similar subsurface contaminant concentrations and have very different indoor air concentrations based on various factors due to vapor intrusion.

I'm just wondering if you could talk a little about a site that has multiple buildings and how that would work this terms of

addressing them? Can one building be considered representative of other buildings on a site or does each building need to be addressed and what would dictate your directions to a site evaluator?

MR. KING: Each building would have to be addressed. There would not be a representative building situation.

HEARING OFFICER McGILL: Okay. There is a question. Identify yourself and your organization.

MR. REOTT: Raymond Reott. So for purposes of evaluating each building separately, you might have some buildings on the site where if contamination was within five feet and, therefore, you were in one table and some buildings on the site would have contamination only below five feet and, therefore, you're using a different table, am I understanding that correctly?

MR. KING: I think that's a correct interpretation.

MS. GEVING: Mr. Reott, did you mean further away than five feet? You said below five feet.

MR. REOTT: Deeper than five feet.

MS. GEVING: Deeper than five feet?

MR. REOTT: Yes. So some are using table line and some are using table inch; is that right?

MR. KING: Yes. I think that's correct.

MR. REOTT: Okay. Thank you.

HEARING OFFICER McGILL: Any other related questions, including any questions for Subpart B?

Seeing none, we will move on to questions Subpart C, which is entitled, "Exposure Route Evaluations."

Question 1, Section 742.312, Indoor Inhalation Exposure Route, Question (a), Regarding the references made in Section 742.312(a), can there be contaminants of concern that come within the Section 742.200 definition of "volatile chemicals" but not appear on Appendix A, Table J list of volatile chemicals?

MR. KING: That's correct. There may be non-TACO chemicals of concern at a site that meet our proposed definition of volatile chemicals. Sites contaminated by those chemicals

would need to request site-specific remediation objectives from IEPA.

HEARING OFFICER McGILL: Question (b), Can the indoor inhalation exposure route be excluded under Section 742.312(a) where volatile chemical contaminants of concern are detected, but below the applicable Tier 1, Table H or Table I remediation objectives?

MR. KING: Let me read through the question again to make sure I understand.

The answer there is no because contaminant levels that are below the applicable Tier 1 levels do not need to be excluded under Section 742.312(a). Pursuant to Section 742.500(c), any given exposure route is not a concern if the concentration of each chemical of concern is below the Tier 1 value for that given route and in such a case, no further evaluation of that route is necessary.

HEARING OFFICER McGILL: Question (c), Section 742.312(b)(1)(C) refers to a "demonstration" of active biodegradation has been made such that "no indoor inhalation will occur." Please elaborate on these terms. For example, IEPA pre-filed testimony

refers to Appendix C, Table M. That's King pre-filed testimony at eight.

MR. KING: One of the things we've seen particularly over the last almost three years now since we filed the 2008 proposal is that there's a growing body of research which shows that as BTEX contaminants move upward through the vadose zone from contaminated groundwater, it will degrade in the soil above as long as the soil above is not contaminated and has sufficient oxygen levels.

We envisioned that a demonstration could occur in either of the two ways. The first would involve a use of a model that's been approved by IEPA in the collection of site-specific parameters that allow the model to function. One of the models that's out there for consideration is the biovapor model and that appears to have some promise in this regard.

We at the Agency are going to receive training from the model's author on April 20th of this year between the hearings and that will give us a good opportunity to be able to figure out how usable biovapor will be. It may turn out that it's a good approach and we understand

it and it will fit into the context of what we've proposed and it may turn out it won't work.

The second approach would involve a very site-specific evaluation of site conditions that demonstrate that biodegradation is occurring.

Our proposal uses the terminology no indoor inhalation will occur because it's our expectation that the modeling exercise, whether it's a more generic one or a very site-specific one is going to demonstrate that the BTEX contamination is completely degraded by the time it would reach indoor air.

HEARING OFFICER McGILL: Meaning that it would not be detectable?

MR. KING: Right.

MR. RAO: So you have a similar provision in 742.310 for outdoor inhalation, too, so the same rationale applies to that section also?

MR. KING: Yes.

MR. RAO: And this demonstration that you --

MR. KING: Let me just make one clarification on that. We won't be able to use -- I talked about the biovapor model. We won't be

able to use biovapor for outdoor air because outdoor air, as we talked about earlier, uses the SSL equations. Biovapor is using the J&E equations. So, you know, you can't mix the two.

MR. RAO: So this demonstration is a requirement of this inhalation exposure route as you proposed in this rulemaking? It's not an existing part of some other part of TACO rules where you require active biodegradation?

MR. KING: No. This is a new thing. This is brand -- that is not -- something like that has been provided in other parts of TACO.

MR. RAO: So you believe that this language that you propose provides adequate guidance to the regulative community? It's pretty vague in the way it's been proposed.

MR. KING: I would agree it's fairly vague and it's fairly open ended and we -- it's not central to our proposal in any way and, in fact, we probably could use a Tier 3 approach and get to the same point without having that language in there. However, we did want to -- we did put it in there in recognition that there was an ongoing and growing body of research that indicates that act of

biodegradation does occur relative to the BTEX contaminants.

MR. RAO: And it is part of a condition that has to be met to --

MR. KING: No, it's not. It's an alternative.

MR. RAO: It's an alternative?

MR. KING: It's an alternative.

HEARING OFFICER McGILL: For excluding the exposure route?

MR. KING: That's correct.

MR. RAO: All right. Thank you.

HEARING OFFICER McGILL: Question (d), Can different exposure routes be addressed under different tiers?

MR. KING: The answer is yes.

HEARING OFFICER McGILL: Anyone else have any questions relating to Subpart C?

Seeing none, we will move on to Subpart D, which is entitled, "Determining Area Background."

MR. KING: Could I add just a clarification and response to the question where we discussed the biodegradation issue? I mean,

we've very specifically restricted that to the BTEX contaminants because that's what the research is showing. Research is not showing an active biodegradation relative to any other constituents and particularly it's not showing that with regard to the chlorinated compounds.

MR. RAO: So when you say the research is not showing biodegradation with our compounds, do these studies have -- have they included other compounds to evaluate whether biodegradation is going on or are these studies focused on BTEX?

MR. KING: The studies have focused on BTEX in showing that it is occurring.

HEARING OFFICER McGILL: Okay. We'll move on to questions in Subpart D, "Determining Area of Background."

MS. LIU: Section 742.410, in the now withdrawn R09-9, with errata sheet number one under Section 742.410, Illinois IEPA is proposing to strike what's quoted as a prescriptive approach provision and instead propose adding the following language: "Area of background shall be determined by using a statistically valid approach appropriate

for characteristics of the data set that is approved by the Agency." Would you please explain why the same language is not now proposed?

MR. KING: Well, when we prepared the 2010 proposal for filing, we consciously went back and looked at the 2008 proposal to see if there were parts of that that did not deal with the indoor inhalation route.

Okay. So this change that was proposed in 2008 does not directly deal with the indoor inhalation exposure route so we did not include it in this rulemaking. At some point, we will come back with a proposal that addresses changes to TACO outside of the indoor inhalation route and then this will be that -- that would be the time to put that kind of provision in there for consideration.

HEARING OFFICER McGILL: Any other questions relating to Subpart D?

Seeing none, we will move on to Subpart E entitled, "Tier 1 Evaluation," question one, this relates to Sections 742.505 and 742.515.

Proposed Section 742.515(a) and (b) refer to question an "existing or potential

building or man-made pathway," while Sections 742.505(b)(2)(C) and (D) refer only to a "existing or potential building." Question (a), Should this rule language be reconciled?

MR. KING: The answer is yes and we will make that change in the subsequent errata.

HEARING OFFICER McGILL: Question (b), What is the basis for selecting "five feet" with respect to location of contamination in relation to such a structure?

MR. KING: The source for five feet is USEPA's 2004 User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings. The statement there occurs in Page 41 where it discusses that the affective zone of influence is limited through zones within one to two meters of the building foundation. That document is in our -- is part of our incorporation by reference.

HEARING OFFICER McGILL: Thank you. If you could identify yourself again, please, for the record.

MR. REOTT: Yes. Raymond Reott. Just one question about the affective zone. If you have contaminants -- if you don't have contamination

within the five-foot zone and you're going to attempt to use the table, what happens if you don't have groundwater within any reasonable distance of the surface because you're supposed to be able to show both groundwater and soil gas? What happens if you don't have groundwater within any reason depth?

MR. KING: Well, then, you would have to use Table I -- excuse me -- you would have to use Table H.

MR. REOTT: I mean, you're saying you're relegated to a more stringent table even though you don't find groundwater at all?

MR. KING: Well, I mean, you always have the potential of going to Tier 3.

MR. REOTT: Yeah, but this is by definition a site that is trying to opt out quickly. It's got no contamination within five feet of the surface. The only reason they're even thinking about groundwater is because of the multiple lines proposal. If they don't find groundwater within a -- pick a number -- some reasonable distance of the surface, why are they still worrying about the groundwater issue?

MR. KING: Well, I mean, I don't know what to say other than there's the -- you have Table H and Table I and there are certain requirements for using either of those tables and if they don't work, then, you would be going to Tier 3 approach.

MR. REOTT: Thank you.

HEARING OFFICER McGILL: Any further questions on Subpart E?

Seeing none, we will move on to questions concerning Subpart F, which is entitled, "Tier 2 General Evaluation." Question 1, Section 742.600, Tier 2 Evaluation Overview, In Subsection (k), instead of referring to the "lower" remediation objective, would it be better to refer to the "more stringent" remediation objective as is done elsewhere in Part 742?

MR. KING: Yes, that's correct. We intend to make that change in the subsequent errata.

HEARING OFFICER McGILL: Are there any other questions relating to Subpart F?

Seeing none, we will move on to Subpart H, which is entitled, "Tier 2 Groundwater Evaluation."

MS. LIU: Section 742.812, Why is the thickness of the capillary fringe in proposed Subsection (b) increased to 37.5 centimeters from 17 centimeters as proposed in R09-9?

MR. KING: We increased the capillary fringe thickness from 17 centimeters to 37.5 centimeters because the 37.5 centimeters is associated with soils more typical of Illinois. Both values come from the U.S. Soil Conservation Soil Texture Classification Table, which is used by the USEPA in the 2004 User's Guide that's incorporated by reference.

The 17 centimeters is associated with sand. The 37.5 centimeters is associated with loam. Silt and clay have thicker capillary fringes than loam.

HEARING OFFICER McGILL: Any other questions related to Subpart H?

Seeing none, we will move on to Subpart I, which is entitled, "Tier 3 Evaluation."

MR. RAO: Section 1, Section 742.935, Indoor Inhalation Exposure Route, 1 (a), Please explain why proposed Section 742.935 does not provide for establishing groundwater remediation

objectives.

MR. KING: Well, here's the progression we went through. We included Section 742.935(c) for soil gas objectives because it is a medium for measurement that had not been previously addressed in TACO.

We then included Section 742.935(d) for soil objectives because we had taken out the Tier 1 values and the Tier 2 equations for soil only, which had been part of the 2008 proposal.

So we didn't really think that it would be needed to include basically Section 742.935(e) for groundwater, but we could do that and we could do that in a subsequent errata that would be -- if Board thinks that would be a useful addition.

MR. RAO: And to make it more complete to have it in there?

MR. KING: Okay. Well, we'll work on putting that together.

MR. RAO: Would this section also be appropriate for adding language regarding the -- earlier this year, we talked about --

what was it -- indoor air sampling. You know, would this section be appropriate to have a small subsection or a subsection to say --

MR. KING: We will look at addressing that in some fashion in two or three. I don't know if we want to have a subsection, but we will look at least including a reference to indoor air.

MR. RAO: Okay.

MS. LIU: As a follow-up to the discussion on indoor air sampling, Mr. King, you mentioned that USEPA did not express any concerns with IEPA's lack of including indoor air sampling in its proposal?

MR. KING: As Tier 1 or Tier 2?

MS. LIU: During your outreach efforts, did you hear any concerns from either the regulative community, the environmental groups or the community at large regarding the lack of indoor air sampling?

MR. KING: You know, we did not. Certainly from the regulating community, we did not hear anything. We did not hear anything from any other groups although I'm told that there's been some media publications in which

some citizen groups have raised this as an issue, but they have not made any kind of formal comment or raised it directly to us.

MS. LIU: You mentioned media publications?

MR. KING: Well, it's the -- I think it was in a -- at least what I saw was in a newspaper publication that there was a citizen's group in Champaign that had expressed some concerns. So nothing directly that came to us in the course of developing this rule that said you should include indoor air provisions.

MS. LIU: Thank you.

HEARING OFFICER McGILL: I have just one follow-up to that. Are there provisions in current TACO or in your proposal for community outreach or community involvement at any given TACO site?

MR. KING: Oh, at individual sites?

HEARING OFFICER McGILL: How does that work? I don't know does it come from underlying regulatory programs or does it come from TACO or site-by-site?

MR. KING: One of the things that

happened in 2009 was the right to know provisions under Illinois were amended and there is a reference in that amended right to know law that discusses soil gas, you know, that would be applicable for indoor inhalation concerns. So previously, it had covered soil and groundwater and the right to know law now discusses soil gas that would be off-site.

So that's a potential for there to be community involvement relative to indoor inhalation issues once the Board rule is finalized. That provision in the statute, it refers to soil gas being above Board standards off-site and, you know, until there is some kind of Board standards in place, there is nothing that effectuates that part of the right to know provision. So that's again another reason to push forward on something here.

HEARING OFFICER McGILL: For the record, do you happen to know the ILCS cite for that?

MR. KING: No, I don't.

MS. GEVING: May I ask a follow-up question?

HEARING OFFICER McGILL: Could you

just provide the statutory cite for us for the record? Thank you.

MS. GEVING: I would like to ask a follow-up question, too, based on your line of questions.

HEARING OFFICER McGILL: Sure.

MS. GEVING: Mr. King, if at some point in time you feel that the right to know community outreach provision needs to be put in a regulatory format, would that go into the TACO rules or would that go into specific program rules?

MR. KING: If there is regulatory change, it would go into the rules that pertain in the right to know provisions and there was a -- you know, the Board has a set of rules relative to right to know that we used to implement that statute. So the change would be made there. I mean, it's in the statute.

If the Board rule relative to indoor inhalation went into effect, then, we would use the statutory provision as the implementing vehicle before there was a change in the right to know rules.

MR. RAO: Moving on to Question 1 (b), Is it permissible for Tier 3 evaluation of the indoor inhalation exposure route to take into account site-specific, non-default values for a building's size, ventilation rate, and air exchange rate?

MR. KING: The answer is yes.

MR. RAO: One (c), Must Appendix C, Table M default values be used for these parameters under Tier 2 for the indoor inhalation exposure route?

MR. KING: The answer there is also yes.

MR. RAO: All right.

HEARING OFFICER McGILL: Are there any other questions relating to Subpart I?

Seeing none, we are going to take a short break so why don't we go off the record?

(Whereupon, after a short break was had, the following proceedings were held accordingly.)

HEARING OFFICER McGILL: Why don't

we go back on the record?

Earlier, we had a question for the Agency about a citation as it related to the Community Right To Know Act amendments for vapor intrusion or indoor inhalation or soil gas. I can't remember which I asked. Did you want to go ahead and respond to that?

MS. GEVING: Sure. The citation is -- it's under the Illinois Environmental Protection Act. It's 415 ILCS 5/25(d)-1 through (d)-10.

HEARING OFFICER McGILL: Thank you.

Okay. We will continue now with Board staff question Subpart J, which is entitled, "Institution Controls." Number 1 relates to future construction, (a), Can a "No Further Remediation" (NFR) determination be conditioned upon any new building that may be constructed on the site in the future having building control technology for the indoor inhalation exposure route?

MR. KING: The answer there is yes. If I could, I would like to go into a little bit of an explanation --

HEARING OFFICER McGILL: Sure.

MR. KING: -- as to the difference between what we're suggesting here as to what we've done.

The approach with indoor inhalation in this regard is different from what we do under the existing TACO rule for engineered barriers. Under the existing rule, the engineered barrier must be in place before an NFR letter is issued. They approach the indoor inhalation institutional controls a little bit differently.

If we were to take the same approach for indoor inhalation as we do relative to the engineered barriers under the existing rule, it would mean that all buildings would have to be built in BCTs installed before the NFR determination could be finalized.

That approach could significantly stimey property reuse. We think that it is more sensible to condition the NFR determination on the future installation of BCTs before human occupancy.

I was just handed a note. I think I used BCTs for the first time here and that's short for building control technology.

HEARING OFFICER McGILL: Thank you.

Given the response to (a) is yes, question (b) is if so, what role, if any, what role, if any, would IEPA play in reviewing and approving the building control technology before human occupancy of that new building?

MR. KING: The review is going to be part -- the review of the BCT will be part of the review of the remedial action plan or corrective action plan.

Okay. Once that plan has been finalized and we have issued an NFR letter, we're not going to be looking at -- we're not going to be taking a second bite of the apple, so to speak, to look at BCTs once the building is constructed.

HEARING OFFICER McGILL: So does that differ from how engineered barriers work currently?

Do you -- does IEPA just see a proposed engineered barrier approve of that, but then never actually review the actual installation?

MR. KING: Well, no. There has

to be -- they have to demonstrate that the engineered barrier has been installed.

HEARING OFFICER McGILL: Okay. So given that you won't know exactly what kind of buildings are going to be present in the future, what do you envision as building control technology proposal, you know, for indoor inhalation?

How detailed would that be or how could you anticipate what BCTs would work for buildings?

MR. KING: Well, there would have to be a proposal as to the type of building control technology that would be employed once buildings were built. And so the NFR determination would be conditioned such that, you know, that BCT would be employed before human occupancy would occur in the building.

HEARING OFFICER McGILL: Question (c), other than the threat of voidance of the NFR determination, does Part 742 provide any other compliance measure for such future building control technology?

MR. KING: The answer there is no.

However, one of the things I think is important to realize is the significance of the threat of an NFR voidance. We've had to void -- go through -- we go through the voidance process and when we identify the situation, the general response is immediate compliance.

We have had to complete voidance in only some very rare instances, only a couple of times where it's been a failure to maintain an engineered barrier. The threat of a voidance, if we complete that voidance causes so much in the way of difficulties for that piece of property, that, you know, it's just -- people don't want to have that happen. So it ends up being a fairly significant mechanism for assuring compliance.

HEARING OFFICER McGILL: Question (d), you've already answered this, but just so we finish it out, does IEPA condition NFR determinations upon the future construction and operation of engineered barriers?

MR. KING: The answer there is no.

HEARING OFFICER McGILL: So you have the engineered barrier in place before the NFR letter issues?

MR. KING: That's correct.

HEARING OFFICER McGILL: And then typically, an NFR letter has conditions on the maintenance of that engineered barrier?

MR. KING: That's correct.

HEARING OFFICER McGILL: Again, if you could just state your name for the record?

MR. REOTT: Raymond Reott. Just a quick question. Do you have an existing program to inspect property after the issuance of the NFR letter for compliance with the institutional control of the engineered barrier as required by the NFR letter?

MR. KING: Yes, we do.

MR. REOTT: Could that also be used to monitor compliance with future buildings that would have BCT-type requirements?

MR. KING: We can. There certainly are some -- there's some -- it's a more difficult process because right now, it's fairly routine. If you want to see whether there's an engineered barrier in place, it's fairly simple as far as a drive-by on a site to see what's there.

It would be more complex with

a BCT because it's not -- you know, you have to enter the building to see if it's actually there. We certainly could include that.

HEARING OFFICER McGILL: Is that sort of checking up on sites -- is that done under the underlying regulatory programs like SRP and UST or is that an aspect of TACO?

MR. KING: It's done under the individual programs.

HEARING OFFICER McGILL: Okay. Question 2 concerns additional issues with NFR Determination, Off-Site Matters and Rule Implementation. Question (a), Must a site evaluator address the indoor inhalation exposure route under TACO in order to receive an NFR determination?

MR. KING: Currently, the answer is no. Once there are rules on indoor inhalation in effect, then, the answer will be yes.

HEARING OFFICER McGILL: Question (b), Would issued NFR determinations refer to any specific exposure routes such as noting the indoor inhalation route was not addressed?

MR. KING: I mean, once the rule is

in place, then, all the pathways will have to be addressed.

HEARING OFFICER McGILL: Question (c), Does IEPA plan to "reopen" any sites for which NFR determinations have already been issued, but the site evaluator did not address the indoor inhalation exposure route?

MR. KING: IEPA does not plan to reopen any sites for which an NFR determination has been issued unless we obtain new site-specific information indicating an indoor inhalation problem.

HEARING OFFICER McGILL: So no systematic reopening of sites just because they haven't addressed the inhalation route?

MR. KING: That's correct.

HEARING OFFICER McGILL: Okay. Question (d), Can an NFR determination, issued with an institutional control excluding the indoor inhalation exposure route due to an active biodegradation achieved all applicable Tier 1 remediation objectives?

MR. KING: The answer is yes.

HEARING OFFICER McGILL: Question

(e), If a site evaluator identifies an indoor inhalation exposure route concern on-site from an off-site source, or off-site from an on-site source, how might such off-site matters be addressed in terms of investigation, remediation, and issuance of NFR determination?

MR. KING: Under our current implementation of TACO, a site owner is not required to clean up contamination that is coming from off-site. However, the site owner also cannot use the site in a way that imposes risk.

For instance, even if the contamination from groundwater is coming from off-site to on-site, the site owner cannot close the site unless there are restrictions on you such as portable wells that prevent risk exposure. The same approach will carry forward for indoor inhalation issues.

Similarly, where contamination is moved from on-site to off-site, investigation, remediation and issuance of NFR determinations will occur using the same approaches as under the existing TACO rule.

HEARING OFFICER McGILL: Okay.

Question (f), How would IEPA recommend implementing new Part 742 indoor inhalation rules upon their becoming effective, given that sites will be at various stages of submittals and approvals at the time?

MR. KING: We've been thinking about different approaches to this and one would depend on how the Board actually did its adoption process relative to the rule.

I think one approach would be to establish an effective date for the rule that is later in time than the date of official adoption. If you're going to do a delayed effective date, then, we would suggest no more than 60 days.

If you did a 60-day delay, then, under that approach, the Agency and the regulated community would know what the rule says and then would have a short period of time to complete an NFR issuance process.

This approach would be particularly helpful in situations where the final completion report has been submitted and approved and the Agency and site evaluator are going through the final steps of NFR issuance.

HEARING OFFICER McGILL: So do you think 60 days would be enough time to issue it then?

MR. KING: It would not be enough time if someone were in the first stages of a project, but once the Board comes out with a first notice relative to a rule adoption, it's going to be pretty clear that there is a time frame that there's going to be an adoption of the rule and at that point, certainly anybody who is in the process of doing a cleanup would recognize the need to address the indoor inhalation route before they were going to close the site out.

HEARING OFFICER McGILL: Are there -- is there any instance where the Agency has approved a corrective action completion report or remedial action completion report where that site evaluator should have to go back and do -- address the indoor inhalation route?

I mean, if it's just a question, then, of issuing the NFR determination, I don't know what the deadlines are under the different regulatory programs. Was it 60, 120, 90 days? But I mean, what would the --

MR. KING: We think that -- that's why we thought the 60 days would be appropriate, that if the completion report is in-house, you know, we would agree that if they've submitted that completion report requiring that entity to go back and start over, it's too late in the process, but we think 60 days would be workable.

HEARING OFFICER McGILL: So the Agency preference would be to have a fixed number of days as opposed to saying sites that have approved corrective action completion required subject to it?

MR. KING: We already have quite a few numbered decision points in the process. You then have another decision point as to the -- you know, whether that decision had occurred within a specific time frame or not and was it a formal approval. Now, you could have an appeal based on the timing of all of that.

To me, it would be more straightforward just to have an additional time between an adoption and effective date.

MS. GEVING: Mr. King, in the past, whenever we've gone through different amendments

to the TACO rules, we've taken a different approach. We've always recommended that if something is in-house and hasn't actually had an issued NFR letter by the time the rules are effective, we would then make them go all the way back and start over to address whatever issues we've amended; is that correct?

MR. KING: I think that's generally true. I don't know -- I can't say that has 100 percent occurred at every single site, but I think that's generally true.

MS. GEVING: But we've never recommended before that they have an effective date different than the adoption date; is that correct?

MR. KING: I think that's correct, yes.

HEARING OFFICER McGILL: Has IEPA ever added an entirely new exposure route to TACO or approved amendment?

MR. KING: No. This will be the first time that we've added a completely new exposure pathway.

HEARING OFFICER McGILL: Thank you.

MR. KING: But, you know, I mean, we -- the other thing to keep in mind is we have been telling people that it was our -- we have been telling people in the regulated community, in particular, that our expectation is once this rule goes final and becomes effective, if you don't have an NFR letter, then, you go back and start over.

So there's been plenty of warning that that's the direction we're headed. As I was saying before, once the Board comes out with the first notice, then, it's clear that there's a certain time frame that things are going to happen by.

HEARING OFFICER McGILL: Question (g), relates to the earlier questions here under No. 2. Would IEPA's responses to any of these questions vary depending upon the underlying regulatory program at issue such as the leaking underground storage tank program or the site remediation program?

MR. KING: Well, I think the answer there is generally, no. The one thing that there might be a little bit difference in is that is if

a site has been in the LUST Program and has gotten an NFR determination, if they want to change that NFR determination because, for instance, they want to now eliminate an institutional control, that would not go back through the LUST Program. That would come back through the Site Remediation Program. So that's just a little bit of a difference. The responses are otherwise the same.

HEARING OFFICER McGILL: Is there any distinction with respect to off-site contamination that site evaluator's cite as contamination that is going off-site? Is that addressed differently?

MR. KING: There are distinctions between programs. I mean, we would still have the programs operate as they have in the past. I mean, there is -- the Site Remediation Program is focused on a site based on the parameters that are -- under which it's brought into the program.

The LUST Program, for instance, focuses on a release and where that release ends up. So there is a somewhat different focus that

we have to be cognizant of.

HEARING OFFICER McGILL: But not related to indoor inhalation?

MR. KING: Not as far as I can see.

HEARING OFFICER McGILL: Are there any other questions relating to Subpart J, Institutional Controls?

Seeing none, we will move on to Subpart L, which is entitled, "Building Control Technologies."

MR. RAO: Section 742.1200, Building Control Technologies, Question 1, (a), Regarding grounds for voidance of an NFR determination, please explain whether the Subsection (f) reference to the "failure to maintain" a building control technology as required by the NFR determination would encompass the failure to install such technology in a new building constructed in the future.

MR. KING: The language, "failure to maintain," in my view, does not encompass failure to install. So we're going to go back and include language in the next errata to correct -- to make that correction so that the grounds for voidance

includes failure to install.

MR. RAO: Thank you. Question 1, (b), What sorts of maintenance requirements would be specified in an NFR determination for each of the four building control technologies listed in Section 742.1210(c)?

MR. KING: Well, the maintenance requirements are going to vary relative to the technology employed and manufacturers' recommendations with regards to the use of the equipment for that technology.

For instance, sub-slab and some submembrane depressurization require the use of an inline fan. The manufacturer of that fan will have maintenance specifications for that fan. The NFR determination would condition the operation of the sub-slab or submembrane depressurization system based on maintenance of the fan and in accordance with the manufacturers' specifications.

On the other hand, with a membrane system, once it is properly in place under the slab, there really are no maintenance activities with regards to the membrane.

MR. RAO: Okay.

HEARING OFFICER McGILL: Question 2, Section 742.1210, Building Control Technology Requirements, Question (a), Is it IEPA's intent that the four building control technology listed in Section 742.1210(c) are the only building control technologies that can be used to exclude the indoor inhalation exposure route pursuant to Section 742.312(b)(1)(B)?

MR. KING: The answer to that is yes, that's correct. Other alternatives will have to be reviewed and approved under Tier 3.

HEARING OFFICER McGILL: These will be related, but we will tie it up nicely. Question (b), Please comment on Section 742.1210 should have a provision corresponding to existing Section 742.110(d) on proposing alternative engineered barriers.

MR. KING: We felt that 742.1210 should not include a provision analogous to 742.1105(d) because inclusion of this language would imply a different evaluation than Tier 3. We want those to go to Tier 3. Section 1105(d), that language by itself could allow a review not under Tier 3.

HEARING OFFICER McGILL: And then (c), Under the proposed rules, must a proposal for building control technology other than any of the four listed in Section 742.210(c) proceed under Tier 3, proposed Section 742.935(b)?

MR. KING: The answer there is yes.

HEARING OFFICER McGILL: Thank you. Question (d), Why were the four Section 742.1210(c) building control technology singled out for recognition?

MR. KING: We, of course, concluded that there needed to be some type of building control technology identified in the rule and when we went through our review of looking at literature relative to building control technologies, we did not see any other options other than these four.

In the 2008 proposal, we proposed the first three options. In the 2010 proposal, we added the fourth option based on the proposal and discussion with the consulting engineer with considerable experience in the field of indoor inhalation. We did not receive any proposals for inclusion of other technologies beyond the BCTs

that we did include.

HEARING OFFICER McGILL: Is it the Agency's position, then, that these four technologies would be considered technically feasible and economically reasonable?

MR. KING: Yes.

HEARING OFFICER McGILL: I just had a follow-up question on economics. In the statement of reasons at Page 8, the Agency states that the proposed indoor inhalation amendments will increase the cost of some site cleanups, but will bring important benefits and the Agency goes on to discuss those benefits.

Later, also on Page 8, the Agency says the extent of anticipated cost increases and is unknown and could vary widely depending on site contaminant characteristics and willingness of affected property owners to accept building control technologies and ambient institutional controls.

I was just wondering if you could provide a little more background on expected cleanup cost increases by adding this exposure route?

Let me ask the other related question and maybe that will help answer the first one. How often would the indoor inhalation exposure route be the driver of site cleanups?

MR. KING: We are not expecting the indoor inhalation route to be the driver pathway on a very high percentage -- it should be allow percentage of sites. If it's the driver on more than 10 percent, I would be surprised.

HEARING OFFICER McGILL: Are there any other questions relating to Subpart L, building control technologies or economics?

Seeing none, we will move on to questions relating to the appendices.

Well, you indicated you expected -- we'll go back to the economics for a moment. The statement of reasons indicated you expected cleanup costs to increase. Is that just because an additional exposure route is being addressed? What sort of cost increases are you expecting?

MR. KING: Well --

HEARING OFFICER McGILL: What type and I don't know if you have any idea of magnitude,

the actual dollar amounts, but what do you think about that?

MR. KING: As far as the investigation, if a site either chooses or has to use a soil gas as -- a measurement of soil gas as a way of something they have to do to demonstrate compliance, then, that's an additional cost that really is not the same as what we have now.

The investigation of groundwater contamination would be, you know, virtually the same as what we're doing under the existing rule. The compliance -- the remediation aspects are going to depend on whether other pathways have been excluded based on Section 312 or Tier 3 -- not 312 -- I've got the wrong section, but we do allow for the exclusion of pathways, for instance, relative to groundwater ingestion.

Those would not apply towards exclusion of groundwater inhalation. So there could be a cleanup cost relative to a site that's not -- you know, does not exist. I mean, it would -- that cost would there on indoor inhalation when it would not be there now.

HEARING OFFICER McGILL: So I

mean, looking at the Agency's proposal overall, there is going to be new technical requirements for soil gas analysis. Is that something that is -- that consultants know how to do?

Is that a common thing with labs and that sort of thing?

MR. KING: Yes. All that is -- I won't say it's a -- it's not as common as soil testing or groundwater testing, but there -- it is certainly -- there are certain ways of measuring soil gas levels that are accepted. The equipment is there. Laboratories do it.

HEARING OFFICER McGILL: And those costs are comparable to soil and groundwater testing?

MR. KING: I think in some cases, they may be higher, but probably, we're not going to see the number of soil gas samples that you would for soil or groundwater at a site. Those would be more limited -- there would be more limited number of soil gas samples taken.

HEARING OFFICER McGILL: How would you physically collect a soil gas sample?

MR. KING: Oh, boy. We're going to --

HEARING OFFICER McGILL: In general terms. I mean, there is a mooring that's done or is there --

MR. KING: I would almost rather have somebody in the audience who does that kind of sampling talk about it if they are willing to do that.

HEARING OFFICER McGILL: If they're willing to be sworn in. Any volunteers?

MR. MARTIN: I'd be happy to help you. I'm Brian Martin, employed by Ameren. Also representative of the Remediation Advisory Committee.

HEARING OFFICER McGILL: Would you mind being sworn in?

MR. MARTIN: Sure.

(Witness sworn.)

HEARING OFFICER McGILL: Thank you. Do you want me to try to rephrase my inartfully worded questions?

MR. MARTIN: I was trying to follow along with the questions. I don't have specifics about the economics of building control technologies. So I would prefer not to talk

about those in detail, but in terms of the soil gas investigation, we're seeing on the projects that I work on costs are generally around $20,000 to start just for the soil gas survey.

That includes all of the testing activities and the original costs. That could increase, of course, with the scope and complexity with the specific site.

You asked how the samples are collected. It's somewhat different than collecting a groundwater sample. We use a geoprobe, a direct push device, that drives a hollow tube into the ground, if you will, and we connect a vacuum canister to the tip on the probe and pull soil gas from the surrounding soil. So it's different than groundwater monitoring. There's no mooring, per se.

HEARING OFFICER McGILL: Thank you.

MS. LIU: In terms of the costs of building control technologies, I remember in R09-9, there was some expert testimony by one of the manufacturers of one of the building control technology types. I don't remember specifically whether or not there was economic information along

with that, but was that ever intended to be part of the Agency's proposal to provide information on maybe a per square foot basis on the economics behind some of the BCTs?

MR. KING: I do remember that information that came forward. I thought -- I thought they were talking on a -- that was the folks that did the membrane installation and I believe they were talking in the neighborhood of $5 to $10 a square foot for a commercial building.

HEARING OFFICER McGILL: Is that the kind of information you could gather for the next hearing perhaps from the manufacturers you have been working with?

MR. RAO: Also, if you have it in the other docket, if you can --

MR. KING: Yes. I think we can pull some of that forward.

MS. NIFONG: Also, one of the documents that we incorporated by reference from ITRC, their Practical Guide to Vapor Intrusion, they provide a survey of the different BTCs and the dollar amounts.

MS. LIU: Thank you.

HEARING OFFICER McGILL: I take it Agency's position is that its proposal of both in terms of sampling and BCTs is economically reasonable?

MR. KING: We think it is. We tried to create a proposal that was -- would address the pathway in a practical way where it was -- somebody could demonstrate compliance and also could do so in an economically reasonable way.

MR. REOTT: Raymond Reott. I have reviewed that testimony. The cost of it was actually there. It was a $1.50 to $2.25 per square foot installed with a smaller number being for a larger building and the larger number for the smaller building.

HEARING OFFICER McGILL: Could you identify the date?

MR. REOTT: Sure. March 12, 2009.

HEARING OFFICER McGILL: This is from the R09-9 rulemaking?

MR. REOTT: Yes. I have a different sort of broader question, which is to what extent should we go back to that rulemaking, pull up

stuff from that record, and resubmit it or is that necessary? Some of the issues are the same obviously.

HEARING OFFICER McGILL: I would say to the extent you think there is a particular portion of that rulemaking record relevant, you should file a motion for the Board to incorporate that into this rulemaking record.

The Agency's new proposal, R11-9, this isn't a judgment, but it didn't incorporate or move to incorporate any aspect of the former proposal. So this rulemaking record needs to stand on its own.

MR. KING: One further comment as far as sampling indoor air, I mean, if we were focused on sampling indoor air, we believe that would have a significant increase in the costs of site investigation.

HEARING OFFICER McGILL: Any information you could give to substantiate that would also be helpful.

MR. KING: Okay.

HEARING OFFICER McGILL: Any other questions on technical feasibility and economic

reasonableness?

Seeing none, we will move on to questions regarding the appendices?

MS. LIU: Question No. 1, Appendix A, IEPA indicates that Appendix A, Tables E and F have been updated with 14 new chemicals, the same that were added to the proposed at Groundwater Quality Standards in pending R08-18. Pre-filed testimony of Hurley at seven.

In R08-18, IEPA listed 15 new chemicals including molybdenum. Later, IEPA withdrew that chemical from the proposal leaving 14. Of the 14 chemicals, would you please explain why perchlorate is not included in the proposed Part 742, Appendix A, Tables E and F, or Appendix C, Table E?

MS. HURLEY: As part of this rulemaking, we removed everything that was not part of the indoor inhalation exposure route and perchlorate is not a volatile chemical so it's not part of the indoor inhalation exposure route and it's an inorganic so it's not included on Appendix C, Table B or at least the physical chemical parameters.

Perchlorate and the other new chemicals that are being added because of the proposed explained groundwater standards, they will be included in future TACO amendments.

MS. LIU: Okay.

MR. RAO: Question 2, Appendix A, In withdrawn R09-9, a new Table L in Appendix A was proposed, but it is not included in the pending R11-9 proposal. In R09-9, Table L, was entitled "Soil Saturation Limits, (Csat) for Volatile Chemicals for the Indoor Inhalation Exposure Route." Please elaborate on whether a version of Table L is anticipated to be part of the "new proposal" contemplated by IEPA to be submitted later.

MS. HURLEY: The withdrawn Appendix A, Table L, was to be used when developing soil remediation objectives for the indoor inhalation exposure route and because we no longer have Tier 1 soil remediation objectives for the indoor inhalation route, this table was removed.

If the soil remediation objectives for the indoor inhalation route are developed in Tier 3, they will need to be compared to and capped

with the Csat values.

MR. RAO: So do you think there will be a need for this table or will that be done at part of the Agency's review?

MS. HURLEY: It would be done as part of the Agency's review under Tier 3 and I think we list that equation, do we not?

MS. NIFONG: We have the equation listed in our original proposal. It's not there now. We took out all the equations related to soil remediation objectives.

MS. GEVING: I think that completes our answer.

MS. HURLEY: Well, I just wanted to add that if someone came in with a Tier 3 soil objective, they would probably want to compare it to a site-specific Csat depending on what their FOC site -- FOC value is.

MS. GEVING: And when does FOC stand for?

MS. HURLEY: I'm sorry. Fraction organic carbon.

MR. RAO: So they make that as part of their Tier 2 proposal to the Agency?

MS. HURLEY: Yes.

MS. LIU: Question 3, Appendix C, Appendix C, Table M, under "Groundwater remediation objective" lists the source as "Appendix B, Table E, or Equation J&E 6, Appendix C, Table L," and the last column indicates "Chemical-Specific." Please comment on whether the last column should also indicate or calculated value.

MS. HURLEY: Yes, it should or indicate calculated value also and we will correct this in the subsequent errata also.

HEARING OFFICER McGILL: Thank you. Any other questions relating to the appendices?

Seeing none, I will ask if there are any other questions relating to any aspects of IEPA's proposal? Mr. Reott?

MR. REOTT: Raymond Reott again. I had one topic that didn't seem to fit into any other questions, which was did a change in the water filled soil porosity in the entire proposal, which was discussed in Gary's pre-filed testimony on Pages 13 and 14, there are changes to capillary infringement. In the pre-filed testimony, it just

talks about it being typical, in other words, the changes in the value were more typical. I wonder if you could explain why you felt that the new value is more typical.

MS. HURLEY: During the last set of hearings, we received comment that sand was not typical soil and I think that's was by you, Mr. Reott.

MR. REOTT: Yes.

MS. HURLEY: Also, during these revisions, we received comment from others that they didn't think it was reasonable that we assumed sand. So, we did some research and one of the sources listed on our list of studies and reports is U.S. Department of Agriculture and Natural Resources Conservation Service had a 1992 document had proposed Illinois state soil and we discovered that loam is actually more typical of Illinois soils. So we have assumed a loam soil and our soil parameters correspond to a loam soil now.

MR. REOTT: So that's the source water fill porosity?

MS. HURLEY: Yes.

MS. GEVING: Could we have just a few minutes to look at this issue?

HEARING OFFICER McGILL: Sure. Why don't we go off the record for just a few minutes.

(Whereupon, a discussion was had off the record.)

MS. NIFONG: Let me see if I can understand to address your question, Mr. Reott.

HEARING OFFICER McGILL: Are we back on the record?

MS. NIFONG: Yes.

HEARING OFFICER McGILL: Why don't we go back on the record.

MS. NIFONG: So to address your question, Mr. Reott, I think they're asking about a change that happened that we reference in our statement of reasons where in trying to reconcile the concerns with USEPA, we looked at increasing our water fill porosity value to be 0.3 and in meeting with EPA and their subsequent written comments and our subsequent meetings, there was a question as to whether that water fill porosity values would be representative of Illinois soils.

So we looked at it and it turned

out to be a measurement that isn't collected routinely in the field. So we backed off from that. It also would have conditioned the use of our Tier 1 table. So all this discussion took place in the interim from withdrawing the first proposal and working on the submittal from November. So in finalizing our proposal, we reverted back to the value that you see now in Table M, which is for water filled porosity and it's 0.15.

MR. REOTT: Which is the same?

MS. NIFONG: Yes, yes. So we contemplated increasing it, which would have lead to less restrictive remediation objectives, but in the end, we didn't feel it could be technically supported and so we reverted back to the 0.15.

MR. REOTT: Okay. Thank you.

MS. LIU: So is the 0.15 based on sand or loam or what?

MS. NIFONG: It comes from SSL. I think it's based as much on depth and we may need to look at that and get back to you to answer the question.

MS. LIU: At least to answer Mr. Reott's question.

HEARING OFFICER McGILL: Mr. Reott, did you have any other questions?

MR. REOTT: No.

HEARING OFFICER McGILL: Any other questions relating to any aspect of IEPA proposal?

Seeing none, I would like to ask if there was anyone else who would like to provide testimony today?

Seeing none, I would like to move on to a few procedural items. Why don't we go off the record for a moment, please?

(Whereupon, a discussion was had off the record.)

HEARING OFFICER McGILL: I would like to address several procedural issues before we adjourn.

First, regarding the Board's request for an economic impact study, Section 27(b) of the Environmental Protection Act requires Board to request the Department of Commerce an opportunity to conduct an economic impact study or UCIS on the proposed rules before the Board adopts rules.

DCEO may, within 30 to 45 days of the request, conduct a study on the economic impact

of the proposed rules. The Board must make the economic impact study or DCEO's explanation for not conducting one available to the public at least 20 days before public hearing.

On December 1, 2010, the Board sent DCEO a request to conduct an EIS on IEPA's ruling proposal. On December 7, 2010, the Board received a letter from DCEO's director, Warren Rivley, stating that DCEO was unable to undertake the requested economic impact study. Is there anyone who would like to testify regarding this matter?

Seeing none, I will move on. The second hearing in this rulemaking is scheduled for May 24, 2011, at 9:00 a.m. in Room 2-025 at the James R. Thompson Center in Chicago. If business remains at the end of that day, we will continue the next day, May 25, beginning at 9:00 a.m. in a different room within James R. Thompson Center, Room -040.

We had discussion off the record about pre-filing deadlines and the following schedule was considered reasonable and one we will be able to follow.

Pre-Filed testimony for the second hearing must be filed with the clerk of the Board by May 3, 2011. Pre-filed questions from participants concerning pre-filed testimony for the second hearing must be filed by May 12, 2011. Pre-filed answers to any such pre-filed questions must be filed by May 19, 2011.

The so-called mailbox rule does not apply to any of these filings. Accordingly, the clerk must receive the pre-filed documents by the clerk's filing deadline.

Copies of the transcript of today's hearing should be available on the Board's website by April 8th, which is a Friday.

If anyone has any questions about the procedural aspects of this rulemaking, contact me at (312) 814-6983 or email at mcgillr@ipcb.state.il.us.

Are there any other matters that need to be addressed at this time?

Seeing none, I would like to thank everyone for their participation today and we are adjourned.

(Whereupon, the above-entitled proceedings were adjourned until May 25, 2011, at the hour of 9:00 o'clock a.m.)

STATE OF ILLINOIS)
) SS.
COUNTY OF C O O K)

I, LORI ANN ASAUSKAS, CSR, RPR, do hereby state that I am a court reporter doing business in the City of Chicago, County of Cook, and State of Illinois; that I reported by means of machine shorthand the proceedings held in the foregoing cause, and that the foregoing is a true and correct transcript of my shorthand notes so taken as aforesaid.

Lori Asauskas

Lori Ann Asauskas, CSR, RPR.
Notary Public, Cook County, Illinois

SUBSCRIBED AND SWORN TO
before me this ___ day
of _____, A.D., 2011.

_____
Notary Public

ILLINOIS POLLUTION CONTROL BOARD
March 24, 2011

IN THE MATTER OF:	)	
	)	
TIERED APPROACH TO CORRECTIVE ACTION OBJECTIVES (TACO) (INDOOR INHALATION): AMENDMENTS TO 35 ILL. ADM. CODE 742	)	R11-9 (Rulemaking - Land)

HEARING OFFICER ORDER

On November 9, 2010, the Illinois Environmental Protection Agency (IEPA) filed a rulemaking proposal to amend the Board's rules concerning the Tiered Approach to Corrective Action Objectives (TACO) (35 Ill. Adm. Code 742). IEPA proposes to add the indoor inhalation exposure route to TACO's risk-based methodology. The IEPA proposal includes a statement of reasons and proposed rule language.

The first of the two presently-scheduled hearings will be held in Springfield at 9:00 a.m. on March 29, 2011, and if business remains at the end of that day, will continue at 9:00 a.m. on March 30, 2011. The second hearing will be held in Chicago at 9:00 a.m. on May 24, 2011, and if business remains at the end that day, will continue at 9:00 a.m. on May 25, 2011. On January 31, 2011, IEPA timely filed its prefiled testimony for the first hearing. The deadline for participants to prefile questions for IEPA's witnesses was February 28, 2011, but the Board received no prefiled questions.

Attached to this order are Board staff questions for IEPA's witnesses. These questions, which concern IEPA's rulemaking proposal and prefiled testimony, will be taken up at the first hearing. Given the fast-approaching first hearing, it is recognized that there could be Board staff questions that IEPA may prefer to answer in connection with the second hearing. No written IEPA responses to the attached questions are required for purposes of the first hearing. The hearing officer will of course provide opportunities for other participants in attendance to pose questions to IEPA's witnesses.

IT IS SO ORDERED.

Richard R. McGill, Jr.
Hearing Officer
Illinois Pollution Control Board
100 West Randolph Street, Suite 11-500
Chicago, Illinois 60601
(312) 814-6983 or mcgillr@ipcb.state.il.us

ATTACHMENT TO HEARING OFFICER ORDER
March 24, 2011
Board Staff Questions

Docket R11-9, Tiered Approach to Corrective Action Objectives (TACO) (Indoor Inhalation): Amendments to 35 Ill. Adm. Code 742

Questions on Part 742 Indoor Inhalation Based Upon USEPA Guidance

1. According to USEPA's "Review of the Draft 2002 Subsurface Vapor Intrusion Guidance" EPA 530-D-02-004, posted August 30, 2010 (OSWER review document or ORD),[1] USEPA expects to issue final guidance by November 2012. ORD at 2. Please comment on how IEPA anticipates that it would go about considering both the final guidance and whether the final guidance warrants additional rulemaking before the Board.

2. The OSWER review document discusses "generic" attenuation factors used in the draft 2002 USEPA guidance (2002 Draft) and the need for these to be updated. ORD at 3. Please identify the sources of the attenuation factors used by IEPA to calculate the proposed default Tier 1 remediation objectives and why those sources are appropriate.

3. The OSWER review document suggests that where attenuation factors from the database for the draft 2002 USEPA guidance are relied upon, a "multiple-lines of evidence approach" would provide greater certainty. ORD at 3. It appears that IEPA's proposed approach only requires multiple lines of evidence (*i.e.*, requirement to meet both soil gas and groundwater remediation objectives versus meeting only one or the other) when the mode of transport is "diffusion only" (*i.e.*, soil and groundwater contamination are more than 5 feet from an existing or potential building or man-made pathway). Proposed Sections 742.515(a)-(d).

- Given the sources of the attenuation factors that IEPA relied upon, please comment on whether a multiple lines of evidence approach should be used when the mode of transport is "diffusion and advection," not just "diffusion only."

4. According to the OSWER review document, even when attenuation factors are calculated using a semi-site-specific model and combined with either groundwater or soil gas data, this constitutes only a single line of evidence. ORD at 3-4. The OSWER review document further indicates that although this approach may be sufficiently protective for site screening based on groundwater data, the same generally appears not to hold true for reliance on soil gas data. *Id.* at 4. It appears that proposed Section 742.515(c) under Tier 1 would allow compliance to be determined using soil gas data and a generic attenuation factor. It also appears that proposed Section 742.600(f) under Tier 2 would allow compliance to be determined using soil gas data and a calculated attenuation factor.

- Please comment on whether the determination of compliance under a single line of evidence approach should be limited to groundwater data (not soil gas data) or if a

[1] http://www.epa.gov/oswer/vaporintrusion/documents/review_of_2002_draft_vi_guidance_final.pdf

multiple lines of evidence approach should be used when the mode of transport is "diffusion and advection," not just "diffusion only."

5. Both the draft 2002 USEPA guidance (2002 Draft at 9, 11-12)[2] and the OSWER review document (ORD at 5) recognize the concern for background contamination in indoor air, as expressed by IEPA (IEPA prefiled testimony (PFT) King at 15). Nevertheless, when a site exceeds screening values, the draft 2002 USEPA guidance suggests that it may be appropriate to collect indoor air samples under USEPA's "Tier 3" Site-Specific Pathway Assessment. 2002 Draft at 38; *see also id.* at 7-8, 13. The OSWER review document indicates that USEPA is compiling data to "support the conclusion that many of the chemicals present in the subsurface at vapor intrusion sites are not expected to be present at concentrations of concern in indoor or outdoor air." ORD at 5. The OSWER review document also indicates that the final USEPA guidance may include updates with more specific methodologies for evaluating and making decisions with regard to indoor air sampling. *Id.* IEPA notes its continued rejection of using indoor air data as a general method to demonstrate compliance with remediation objectives under Tier 1 or 2, adding that the proposed rules "do not prohibit the use of indoor data; however, any such request would be a Tier 3 evaluation." PFT King at 15, citing proposed Section 742.935(a).

- (a) Recognizing that the draft 2002 USEPA guidance is proposed to be incorporated by reference, would it be more consistent with that guidance and the OSWER review document to also include an indoor air sampling provision in the rule language of this proposal? (b) Please comment on how IEPA might include such a provision. (c) Did USEPA express any concern with IEPA over the absence of such an indoor air sampling provision in this or the now withdrawn R09-9 proposal? (d) Has IEPA investigated whether any other states have rules or guidance that include an indoor air sampling provision?

6. What is the status of the "guidance document" being prepared by the IEPA internal workgroup to "ease implementation of the new indoor inhalation exposure route"? IEPA Statement of Reasons (SOR) at 8.

Questions on Subpart A: Introduction

1. **Section 742.105, Applicability.** The second sentence of proposed subsection (i) indicates that an evaluation of the indoor inhalation exposure route under Part 742 "does not evaluate the safety or protectiveness of buildings." The sentence appears to be inconsistent with the development of remediation objectives under Tier 2 or 3 that can rely on site-specific building parameters. IEPA's prefiled testimony discusses the proposed language in narrower terms: "The proposal does not address whether contamination within the building, *either in the building structure itself or in products within the building*, may be creating human health risks." PFT King at 3 (emphasis added).

- Should proposed Section 742.105(i) be refined to more clearly reflect the concept in Mr. King's prefiled testimony and to address the apparent inconsistency described above?

[2] http://www.epa.gov/osw/hazard/correctiveaction/eis/vapor/complete.pdf

2. **Section 742.115, Key Elements.** Please explain how the indoor inhalation exposure route is comprised of a *soil gas* component and a *groundwater* component (proposed Section 742.115(a)(5)), but then provision appears to be made for establishing *soil* remediation objectives for the indoor inhalation route pursuant to Tier 3 (proposed Section 742.935(d)).

Questions on Subpart B: General

1. **Section 742.200, Definitions.** The proposed definition of "building" refers to a man-made structure that, among other things, "is intended for or supports any human occupancy for more than six consecutive months."

- (a) Is the choice of "more than six consecutive months" based on any assumptions about human exposures to vapor intrusion? (b) Would a summer rental house that is occupied for only three consecutive months each year fall outside of the proposed definition? (c) Whose intent would control in determining whether a structure is "intended for" human occupancy for more than six consecutive months? (d) Does the determination of whether a structure "supports" human occupancy depend upon whether the structure is actually occupied, or fit for occupancy?

2. **Section 742.210, Incorporations by Reference.** (a) Should the OSWER review document be incorporated by reference? (b) Should ATSDR "Minimal Risk Levels" reflect a date of November 2007 (document filed by IEPA) rather than December 2006 (proposed rule language)? (c) Was ASTM E 2600-08 approved on March 1, 2008 (document filed by IEPA), rather than March 7, 2008 (proposed rule language)? (d) Is "PAHs in Surface Soil in Illinois" dated 2003 (document filed by IEPA), rather than 2004 (proposed rule language)? Also, the version of this document filed by IEPA lacks the identifying references to "We Energies, Milwaukee" and "IEPA" (proposed rule language). (e) The "Technical Background Document for Draft Soil Screening Level Framework Review Draft" filed by IEPA lacks the identifying EPA # and date suggested by the proposed rule language.

3. **Section 742.227, Demonstration of Compliance with Soil Gas Remediation Objectives for the Outdoor and Indoor Inhalation Exposure Routes.** (a) Please explain the rationale for using "at least 3 feet below ground surface" in proposed subsection (d) as the location for collecting soil gas concentrations to compare with soil gas remediation objectives. (b) IEPA states that proposed Section 742.227 "applies to exterior samples collected near the building," in contrast to "sub-slab samples collected directly beneath a building foundation." PFT King at 22. (b-1) Would it merit adding language to proposed Section 742.227 to clarify this distinction? (b-2) Is sub-slab sampling for the soil gas indoor inhalation exposure route only available pursuant to Tier 3 (proposed Section 742.935(c))? (b-3) When IEPA's prefiled testimony refers to "exterior samples collected near the building" in discussing proposed Section 742.227, is IEPA referring only to the indoor inhalation exposure route?

Questions on Subpart C: Exposure Route Evaluations

1. **Section 742.312, Indoor Inhalation Exposure Route.** (a) Regarding the references made in Section 742.312(a), can there be contaminants of concern that come within the Section 742.200 definition of "volatile chemicals" but not appear on the Appendix A, Table J list of volatile chemicals? (b) Can the indoor inhalation exposure route be excluded under Section 742.312(a) where volatile chemical contaminants of concern are detected, but below the applicable Tier I, Table H or Table I remediation objectives? (c) Section 742.312(b)(1)(C) refers to a "demonstration" of active biodegradation has been made such that "no indoor inhalation will occur." Please elaborate on these terms (*e.g.*, IEPA's prefiled testimony refers to Appendix C, Table M (PFT King at 8)). (d) Can different exposure routes be addressed under different tiers?

Questions on Subpart D: Determining Area Background

1. **Section 742.410, Determination of Area Background for Groundwater.** In now withdrawn R09-9, with Errata Sheet No. 1 under Section 742.410, IEPA proposed striking a "Prescriptive Approach" provision and instead proposed adding the following: "Area background shall be determined by using a statistically valid approach appropriate for the characteristics of the data set that is approved by the Agency." Please explain why the same language is not now proposed.

Questions on Subpart E: Tier 1 Evaluation

1. **Section 742.505, Tier 1 Soil, Soil Gas and Groundwater Remediation Objectives; Section 742.515, Tier 1 Remediation Objectives Table for the Indoor Inhalation Exposure Route.** Proposed Sections 742.515(a) & (b) refer to an "existing or potential building or man-made pathway," while Sections 742.505(b)(2)(C) & (D) refer only to an "existing or potential building." (a) Should this rule language be reconciled? (b) What is the basis for selecting "5 feet" with respect to the location of contamination in relation to such a structure?

Questions on Subpart F: Tier 2 General Evaluation

1. **Section 742.600, Tier 2 Evaluation Overview.** In subsection (k), instead of referring to the "lower" remediation objective, would it be better to refer to the "more stringent" remediation objective as is done elsewhere in Part 742?

Questions on Subpart H: Tier 2 Groundwater Evaluation

1. **Section 742.812, J&E Groundwater Equations for the Indoor Inhalation Exposure Route.** Why is the thickness of the capillary fringe in proposed subsection (b) increased to 37.5 cm from 17 cm as proposed in R09-9?

Questions on Subpart I: Tier 3 Evaluation

1. **Section 742.935, Indoor Inhalation Exposure Route.** (a) Please explain why proposed Section 742.935 does not provide for establishing groundwater remediation objectives. (b) Is it

permissible for a Tier 3 evaluation of the indoor inhalation exposure route to take into account site-specific, non-default values for a building's size, ventilation rate, and air exchange rate? (c) Must Appendix C, Table M default values be used for these parameters under Tier 2 for the indoor inhalation exposure route?

Questions on Subpart J: Institutional Controls

1. **Future Construction.** (a) Can a "No Further Remediation" (NFR) determination be conditioned upon any new building that may be constructed on the site in the future having building control technology for the indoor inhalation exposure route? (b) If so, what role, if any, would IEPA play in reviewing and approving the building control technology before human occupancy of the new building? (c) Other than the threat of voidance of the NFR determination, does Part 742 provide any other compliance measure for such future building control technology? (d) Does IEPA condition NFR determinations upon the future construction and operation of engineered barriers?

2. **NFR Determinations, Off-Site Matters, and Rule Implementation.** (a) Must a site evaluator address the indoor inhalation exposure route under TACO in order to receive an NFR determination? (b) Would issued NFR determinations refer to any of the specific exposure routes, such as noting that the indoor inhalation route was not addressed? (c) Does IEPA plan to "reopen" any sites for which NFR determinations have already been issued but the site evaluator did not address the indoor inhalation exposure route? (d) Can an NFR determination, issued with an institutional control excluding the indoor inhalation exposure route due to an active biodegradation demonstration, be made unrestricted if the site evaluator later proves that the active biodegradation achieved all applicable Tier I remediation objectives? (e) If a site evaluator identifies an indoor inhalation exposure route concern on-site from an off-site source, or off-site from an on-site source, how might such off-site matters be addressed in terms of investigation, remediation, and issuance of an NFR determination? (f) How would IEPA recommend implementing new Part 742 indoor inhalation rules upon their becoming effective, given that sites will be at various stages of submittals and approvals at the time? (g) Would IEPA's responses to any of these questions vary depending upon the underlying regulatory program at issue (*e.g.*, Leaking Underground Storage Tank Program, Site Remediation Program)?

Questions on Subpart L: Building Control Technologies

1. **Section 742.1200, Building Control Technologies.** (a) Regarding grounds for voidance of an NFR determination, please explain whether the subsection (f) reference to the "[f]ailure to maintain" a building control technology as required by the NFR determination would encompass the failure to install such technology in a new building constructed in the future. (b) What sorts of maintenance requirements would be specified in an NFR determination for each of the four building control technologies listed in Section 742.1210(c)?

2. **Section 742.1210 Building Control Technology Requirements.** (a) Is it IEPA's intent that the four building control technologies listed in Section 742.1210(c) are the only building control technologies that can be used to exclude the indoor inhalation exposure route pursuant to Section

742.312(b)(1)(B)? (b) Please comment on whether Section 742.1210 should have a provision corresponding to existing Section 742.1105(d) on proposing alternative engineered barriers. (c) Under the proposed rules, must a proposal for building control technology other than any of the four listed in Section 742.210(c) proceed under Tier 3, proposed Section 742.935(b)? (d) Why were the four Section 742.1210(c) building control technologies singled out for recognition?

Questions on Appendices

1. **Appendix A, General**. IEPA indicates that Appendix A, Tables E and F have been updated with 14 new chemicals, the same that were added to the proposed Groundwater Quality Standards in pending R08-18. PFT Hurley at 7. In R08-18, IEPA listed 15 new chemicals, including molybdenum. R08-18, PFT Hornshaw at 5 (May 29, 2008). Later, IEPA withdrew molybdenum from the proposal, leaving fourteen. R08-18, Errata Sheet No. 4.

- Of the 14 chemicals, please explain why perchlorate is not included in proposed Part 742, Appendix A, Tables E and F, or Appendix C, Table E.

2. **Appendix A, General.** In withdrawn R09-9, a new Table L in Appendix A was proposed, but it is not included in the pending R11-9 proposal. In R09-9, Table L was entitled "Soil Saturation Limits (C_{sat}) for Volatile Chemicals for the Indoor Inhalation Exposure Route." Please elaborate on whether a version of Table L is anticipated to be part of the "new proposal" contemplated by IEPA to be submitted later. SOR at 7.

3. **Appendix C, Tier 2 Illustrations and Tables.** Appendix C, Table M under "Groundwater remediation objective" (RO_{gw}) lists the source as "Appendix B, Table E, or Equation J&E 6, Appendix C, Table L," and the last column indicates "Chemical-Specific." Please comment on whether the last column should also indicate ". . . or Calculated Value."

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

NOTICE

Dorothy Gunn, Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601
(Via First Class Mail)

Mitchell Cohen
Chief Legal Counsel
Illinois Dept. of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271
(Via First Class Mail)

Matthew J. Dunn, Chief
Environmental Enforcement/Asbestos
Litigation Division
Illinois Attorney General's Office
James R. Thompson Center
69 W. Washington Street, 18th Floor
Chicago, Illinois 60602
(Via First Class Mail)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the Illinois Environmental Protection Agency's ("Illinois EPA") Motion for Acceptance, Appearance of Attorney, Certification of Origination, List of Studies and Reports Used in Regulatory Development, Statement of Reasons, and the Proposed Amendments a copy of each of which is herewith served upon you.

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: Kimberly A. Geving

Kimberly A. Geving
Assistant Counsel
Division of Legal Counsel

DATE: November 5, 2010

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217)782-5544

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-9
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

ERRATA SHEET NUMBER 1

NOW COMES the Illinois Environmental Protection Agency ("Illinois EPA") through one of its attorneys, Kimberly Geving, and submits this ERRATA SHEET NUMBER 1 to the Illinois Pollution Control Board ("Board") and the participants on the Service List. Tracey Hurley has provided testimony in support of these changes in her pre-filed written testimony, which is also being served upon the Board and the Service List.

Section	
742.210(a)	Add two new incorporations by reference and strike a third. API. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070 (202) 682-8000. "BIOVAPOR-A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0 (January 2010)." Illinois Environmental Protection Agency, 1021 N Grand Ave East, Springfield, IL 62702 (217) 785-0830. "A Summary of Selected Background Conditions for Inorganics in Soil, Publication No. IEPA/ENV/94-161, August 1994." ~~"Risk Assessment Guidance for Superfund, Volume I; Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment Interim Guidance", Draft (August 18, 1992).~~
742.505(~~b~~c)(4)	If the conditions of subsection (c)(3) ~~(b)(3)~~ of this Section are not met, the Class I groundwater remediation objectives set forth in Appendix B, Table E shall be corrected for the cumulative effect of mixtures of similar-acting chemicals using the following methodologies:

App. B, Table G App. B, Table H App. B, Table I	Change the CAS No. for 1,2-Dichloropropane from 78-97-5 to 78-87-5. It was a typographical error in all three of those tables.
App. B, Table G	Replace footnote "d" in its entirety with the following language: "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."
App. B, Table H	Replace footnote "d" in its entirety with the following language: "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."
App. B, Table I	Replace footnote "e" in its entirety with the following language: "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."
App. C, Table E	In the column entitled "Dimensionless Henry's Law Constant (H')(13°C) for the chemical Polychlorinated biphenyls (PCBs), change the footnote "b" to footnote "a."
App. C, Table E	Replace the existing language for footnote "a" with the following language: "Soil remediation objectives are determined pursuant to 40 CFR 761, as incorporated by reference at Section 742.210(b)(the USEPA "PCB Spill Cleanup Policy"), for most sites; persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired. PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical parameters depend on congeners present at the site."
App. C, Table M	Replace the Tier 1 parameter value for Θ_a so that it reads "0.28 or Calculated Value" and not "0.13 or Calculated Value."

Respectfully submitted,

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: Kimberly A. Geving
Kimberly A. Geving
Assistant Counsel

DATE: January 27, 2011

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217)782-5544

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-9
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

NOTICE

Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601
(Via First Class Mail)

Mitchell Cohen
Chief Legal Counsel
Illinois Dept. of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271
(Via First Class Mail)

Matthew J. Dunn, Chief
Environmental Enforcement/Asbestos
Litigation Division
Illinois Attorney General's Office
James R. Thompson Center
69 W. Washington Street, 18th Floor
Chicago, Illinois 60602
(Via First Class Mail)

Richard McGill
Hearing Officer
Illinois Pollution Control Board
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601
(Via First Class Mail)

Participants on the Service List
(Via First Class Mail)

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the Illinois Environmental Protection Agency's ("Illinois EPA") Motion for Acceptance, Pre-filed Written Testimony of Gary P. King and Tracey Hurley, Errata Sheet Number 1, and two additional Incorporations by Reference (to the Clerk of the Board only) copy of each of which is herewith served upon you.

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: Kimberly A. Geving
Kimberly A. Geving
Assistant Counsel
Division of Legal Counsel

DATE: January 27, 2011

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217)782-5544

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-9
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

MOTION FOR ACCEPTANCE

NOW COMES the Illinois Environmental Protection Agency ("Illinois EPA") and, pursuant to 35 Ill. Adm. Code 101.Subpart C and 35 Ill. Adm. Code 102.424, moves the Illinois Pollution Control Board ("Board") to accept the attached Pre-filed Written Testimony of Gary P. King and Tracey Hurley, Errata Sheet Number 1, and two additional Incorporations by Reference for the above-captioned matter.

Respectfully submitted,

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: _____
Kimberly A. Geving
Assistant Counsel
Division of Legal Counsel

DATE: January 27, 2011

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217)782-5544

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	
TIERED APPROACH TO CORRECTIVE	)	R11-9
ACTION OBJECTIVES	)	(Rulemaking-Land)
(35 Ill. Adm. Code 742)		

PRE-FILED TESTIMONY OF GARY KING

Qualifications

My name is Gary King. I am the Manager of the Division of Remediation Management for the Bureau of Land at the Illinois Environmental Protection Agency. Since 1990, I have been senior manager for the Illinois EPA site cleanup programs: the voluntary cleanup program, federal and state Superfund cleanup programs, Department of Defense cleanup program, Brownfields assistance program and the Leaking Underground Storage Tank program. I led Illinois EPA's development of the original 35 Ill. Adm. Code Part 742 rule, Tiered Approach to Corrective Action Objectives (TACO, R97-12) and all subsequent amendments.

I also chaired the Association of State and Territorial Solid Waste Management Officials ("ASTSWMO") CERCLA Research Center from January 2001 to October 2008. In that role I had frequent contact with other States and U.S. EPA concerning important issues to State and federal Superfund programs.

Prior to 1990, I managed Illinois EPA land enforcement programs. I am an attorney and hold a B.S degree in civil engineering from Valparaiso University.

Testimonial Statement

I will be testifying in support of the proposed amendments to 35 Ill. Adm. Code 742: Tiered Approach to Corrective Action Objectives. I will present an overview of the pathway

evaluation and tiered approach to the indoor inhalation exposure route; describe the derivation of the Tier 1 remediation objectives for the indoor inhalation exposure route, including the recommended parameter values for the modified Johnson and Ettinger (J&E) model; and explain the rationale and requirements for the use of soil gas data and building control technologies.

Subpart A: Introduction

Section 742.115 introduces the exposure routes to be evaluated under this Part, including the indoor inhalation exposure route. The indoor inhalation route has two components: a soil gas component and a groundwater component. The soil gas component is the migration of contaminants from soil through soil gas into a building interior. The groundwater component is the migration of contaminants from groundwater through soil gas into a building interior. This pathway is unique in that it involves three types of media: soil, groundwater, and soil gas.

Although the indoor inhalation route involves three media (soil, soil gas and groundwater), the Agency proposal only develops remediation objectives for two of those media: soil gas and groundwater. Unlike the August 2008 proposal (R09-9), the current November 2010 proposal does not develop remediation objectives for soil per se. Soil, like groundwater, can be a source for volatile chemicals to release into soil gas; however, the Agency's review of scientific literature during the intervening period between proposals has revealed considerable skepticism as to whether risks to human health through the indoor inhalation route can be meaningfully determined based on concentrations of volatile chemicals in soils. On the other hand, the scientific literature continues to confirm that indoor inhalation risks can be meaningfully developed based on levels of volatile chemicals in soil gas and in groundwater. As such, the current Agency proposal does not provide soil remediation objectives under Tier 1 or 2, although a site specific proposal could be developed under Tier 3 (Section 742.935(d)).

Section 742.115 also introduces the concept of using soil gas measurements to determine outdoor inhalation risks. Sites that determine soil gas levels for compliance purposes for the indoor inhalation route may also be able to use that data to determine if an outdoor inhalation risk exists. As a result the Agency is proposing a new table in Appendix B, Table G that provides Tier 1 objectives for soil gas for the outdoor inhalation route. For the outdoor inhalation route, the Agency has not proposed deletion of the soil remediation objectives in Appendix B, Tables A and B. The outdoor inhalation route and the indoor inhalation route use two different models. The outdoor route uses the SSL model; this model has been in place for the outdoor route since TACO became effective in 1997. The indoor route uses a modified J&E model. These models use different input elements. For example, the SSL model uses a fraction of organic carbon (foc) value of .006 based on shallow, surficial soils while the modified J&E model uses a foc of .002 based on deeper subsurface soils.

The November 2010 proposal also amends Subpart A by adding a new subsection (i) to Section 742.105. This change makes it clear that the proposed indoor inhalation rules are evaluating whether chemical contamination outside a building may cause a human health risk within a building. The proposal does not address whether contamination within the building, either in the building structure itself or in products within the building, may be creating human health risks.

Subpart B: General

The August 2008 version of Section 742.200 contained new definitions for the terms "building," "building control technology," "soil gas," and "soil vapor saturation limit." The November 2010 version still proposes to use these definitions and adds definitions for "capillary fringe", "saturated zone", "water table" and "Qsoil". These terms appeared in 2008 proposal, but

were undefined. The Agency believes that inclusion of these definitions gives greater clarity to the current proposal. The Agency has made a minor change to the definition of "building control technology". The use of "building control technology" describes mitigation systems for indoor inhalation risks and is compatible with the existing term "engineered barriers." The change makes a minor edit deleting a reference to "geologic materials" and making the revised definition consistent with the building control technologies identified in Subpart L. The current proposal continues with the definition of "volatile chemicals" proposed in 2008. The definition resulted from a re-examination (and eventual deletion) of the original definitions of "volatile organic compounds" and "volatile chemicals." The term is used to define contaminants subject to evaluation under the indoor inhalation exposure route, including elemental mercury.

Section 742.210 contains 22 new incorporations by reference. The vast majority of these 22 also appeared in the 2008 proposal. The most notable of these are U.S. EPA's draft guidance, *Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, which established the use of the J&E model, and its companion document, *Users Guide for Evaluating Subsurface Vapor Intrusion into Buildings*, which provided justification for certain parameter values. Other significant publications include ASTM International's *Standard Practice for Assessment for Vapor Intrusion into Structures on Property Involved in Real Estate Transactions* and the Interstate Technology and Regulatory Council (ITRC)'s *Vapor Intrusion Pathway: A Practical Guide*. Additional incorporations have been included to provide soil gas analytical methods, source information for parameter value selection, and techniques for mitigation systems.

Section 742.222 provides methods for determining the soil vapor saturation limit and parallels Section 742.220, which is used for determining the soil saturation limit. The soil vapor

saturation limit is the maximum vapor concentration that can exist in the soil pore air at a given temperature and pressure. Section 742.Appendix A, Table K presents the soil vapor saturation limits for volatile chemicals. For the indoor inhalation exposure route, soil gas remediation objectives cannot exceed the soil vapor saturation limit; otherwise, the assumptions of the modified J&E model would be violated. The modified J&E model as well as the existing RBCA and SSL models operate on similar assumptions regarding soil saturation and solubility. These risk-based models assume an equilibrium between contaminant concentrations that exist as vapors in soil pores, contaminants that adhere to soil particles, and contaminants that dissolve into water within soil pores.

The Agency has modified existing Section 742.225 to clarify that it applies to soil and groundwater remediation objectives.

New Section 742.227 provides minimum requirements for the collection and analysis of soil gas samples for both the indoor and outdoor inhalation routes. Ordinarily, sampling locations, quantities and protocol are determined by the program under which the remediation is being performed (LUST, RCRA, Site Remediation Program); however, because the use of soil gas data is not as well understood by site evaluators, Illinois EPA decided to specify the most essential criteria to reduce the likelihood of error, the misrepresentation of actual conditions, and the need for repeat sampling. The November 2010 proposal specifies that a helium tracer or other leak apparatus detection system, approved by the Agency, is to be used. Scientific literature since 2008 favors the use of helium as a tracer.

Subpart C: Exposure Route Evaluations

Section 742.312 identifies ways in which the indoor inhalation exposure route may be excluded from consideration. Indoor inhalation presents a risk only if volatile chemicals are the

contaminants of concern. If a site has none of the 59 chemicals listed in Section 742.Appendix A, Table J or any other contaminants meeting the new definition of "volatile chemicals," then the indoor inhalation pathway does not need to be evaluated.

If volatile chemicals are present, the site evaluator has the option of excluding the pathway by either restricting buildings above contaminated areas or by implementing building control technologies. The general pathway exclusion criteria of existing Sections 742.300 and 742.305 must also be met; these are the "speed bumps" to prevent free product, the leaving behind of materials with the potential impact of hazardous waste, and concentrations of polychlorinated biphenyls above 50 parts per million. The November 2010 proposal adds to Section 742.305 a new "speed bump" provision for soil gas. Subsection (g) specifies that an exposure route cannot be excluded if the soil gas exceeds 10 percent of the Lower Explosive Limit.

The proposed building-specific exclusions would need institutional controls as follows:

1. A land use restriction prohibiting a building or man-made pathway above the contaminated soil gas or groundwater. (The indoor inhalation exposure route is incomplete if a building does not exist.)
2. Operation and maintenance requirements for approved building control technologies, including sub-slab depressurization, sub-membrane depressurization, membrane barriers or vented raised floors. These requirements are contained in the new Subpart L: Building Control Technologies.

The indoor inhalation exposure route cannot be excluded by use of a groundwater ordinance. This exclusion is not allowed because an ordinance restricting the use of groundwater

as a source of drinking water would not protect the enclosed air space of a building from the migration of contaminants emanating from the groundwater.

Section 742.310 applies to outdoor inhalation; Section 742.312 applies to indoor inhalation. In both sections the Agency has included provisions that allow for pathway exclusion for the petroleum constituents benzene, toluene, ethylbenzene and total xylenes (BTEX) based on a demonstration of active bio-degradation. Although technically a bio-degradation proposal could be submitted under Tier 3, without regard to changes in Subtitle C, the Agency believes that a specific recognition as to the progress made in identifying active biodegradation of the BETX components of petroleum as part of the inhalation pathway is appropriate and will significantly assist in addressing this pathway. It is important to note that the biodegradation research for petroleum constituents and this pathway do not apply to other volatile chemicals.

Sections 35 Ill. Adm. Code 742.310(a)(2) and 742.312(b)(1)(C) have been drafted broadly enough to accommodate different models as they emerge in the future. One model that is gaining acceptance for use in demonstrating active biodegradation of petroleum constituents (including BTEX) is BioVapor – A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0, American Petroleum Institute, 2009. This model is publicly available at www.api.org. The testimony that follows is not intended to be an endorsement, or even an approval of this model for use at Illinois sites, but is intended to summarize how it functions.

BioVapor uses a spreadsheet function to perform calculations that allow prediction of indoor air concentrations and associated risks from contaminants in soil gas or groundwater. It also calculates backwards to determine acceptable soil gas and groundwater concentrations from indoor-air screening levels. The model applies bioattenuation only when sufficient oxygen is

present in the vadose zone (i.e., aerobic bioattenuation). It uses a mass-balance approach to ensure that the amount of bioattenuation does not exceed the amount of available oxygen (LUSTLine Bulletin 66, December 2010, p.19). In general uncontaminated soils have higher oxygen levels than contaminated soils, thus allowing bioattenuation to occur. The Utah Department of Environmental Quality, Leaking Underground Storage Tank Section has done considerable work in demonstrating the capacity of uncontaminated soils to bioattenuate BTEX levels moving upward through the vadose zone. That work was recently reported at www.newipcc.org/lustline/supplements.asp.

Input parameters for BioVapor include environmental factors, the chemicals to be evaluated, and the chemical concentrations. Use of BioVapor, or any other model, at Illinois sites will have to be consistent with the default parameters in 35 Ill. Adm. Code 742, Appendix C, Table B or Table M for the outdoor or indoor inhalation exposure route, respectively. If there is a conflict, the default parameters in Appendix C, Table B or Table M will have to be used.

Following a successful demonstration of active biodegradation, a clean soil layer above the contamination will need to be maintained to allow biodegradation to occur and to prevent BTEX migration into a structure. This requirement would be incorporated into an institutional control as provided under Section 742.1000(a)(6).

Subpart E: Tier 1 Evaluation

A Tier 1 remediation objective is a numerical chemical concentration that represents a level of contamination at or below which there are no human health concerns. Sites achieving residential Tier 1 remediation objectives are intended to clearly indicate that the property meets an unrestricted land use category for that category of use. Tier 1 requires a determination of either residential or industrial/commercial land use. Generally, equally protective but less

restrictive remediation objectives apply to the industrial/commercial sites. [Note: whenever remediation objectives are based on an industrial/commercial land use, an institutional control must be placed on the property in accordance with Section 742.1000(a)(1).]

As with the other exposure routes, the indoor inhalation remediation objectives are calculated based on a one-in-a-million individual excess cancer risk for chemicals causing carcinogenic adverse health effects and a hazard quotient of one for chemicals causing noncarcinogenic adverse health effects.

Risk-based indoor inhalation remediation objectives were derived from equations combining exposure assumptions with toxicity data. The steps used to develop the soil gas and groundwater remediation objectives included:

1. Calculating a concentration of the contaminant of concern in indoor air that adequately protects humans who inhale this air (i.e., meets the above mentioned risk criteria);
2. Calculating an acceptable concentration of the contaminant of concern in the soil gas at the source of contamination. This concentration will not cause the contaminant in indoor air to exceed the concentration calculated in Step 1. This calculation was made using an attenuation factor derived from a mathematical model developed by Johnson and Ettinger (J&E). [Note: the ratio of the concentration in the indoor air (Step 1) to the soil gas concentration is called the attenuation factor. Thus the primary use of the J&E model is to calculate the attenuation factor.]

3. Calculating acceptable groundwater remediation objectives using the soil gas remediation objective calculated in Step 2, with the assumption that this contaminant is in three phase equilibrium.

The J&E model is the most common predictive model used by State environmental agencies in calculating the attenuation of contaminant concentrations from the subsurface to indoor air. The attenuation factor accounts for the following processes:

1. Migration of contaminants from the source upwards through the vadose zone. The source of contaminant concentrations in the subsurface may be either soil or groundwater. If the source is groundwater, the attenuation factor considers the initial migration of contaminants through the capillary fringe.
2. Migration of contaminants through the dirt filled cracks in the slab-on-grade or basement floor.
3. Mixing of the contaminants with air inside the building.

Illinois EPA provides 18 J&E equations and 54 default parameter values (Section 742.Appendix C, Tables L and M). Exposure factors are consistent with the values used in the current TACO regulations. Toxicity factors were obtained using U.S. EPA's hierarchy and are chemical-specific. Existing Sections 742.505(b)(3) and (4), which contain the procedures for addressing the additive effects of similar-acting chemicals in developing Tier 1 groundwater remediation objectives, also apply to the indoor inhalation exposure route.

Tier 1 remediation objectives have been developed for a slab-on-grade building. A slab-on-grade building is a more conservative scenario because there is less air available in the building to mix with the contamination. A building with a basement assumes there is mixing of the air between the basement and the first floor. Tier 1 remediation objectives are applicable to

both slab-on-grade buildings and buildings with basements.

A slab-on-grade building is one with a concrete floor at about the same level as the grade of the surrounding area; a basement would typically be below the grade of the surrounding area. Tier 1 indoor inhalation remediation objectives calculated for a slab-on-grade building are not much lower than what would be developed for a similar building with a basement.

Building-specific default values for the following parameters were used to develop the Tier 1 remediation objectives: length of building (L_B), width of building (W_B), height of building (H_B), surface area of enclosed space at or below grade (A_B), and building ventilation rate (Q_{bldg}). The same default values must be used for the same parameters when performing Tier 2 calculations. The actual values of these parameters do not have a great impact on the remediation objective; however, the default values are based on a conservative representation of the type of buildings that are or may be present at the site in the future. Without these conservative values, restrictions would be required on the minimum size of a building that can be constructed over the contaminated area.

For the indoor inhalation exposure route, the industrial/commercial remediation objective differs from the residential remediation objective in three ways: exposure duration, building size, and air exchange rate. The air exchange rate (ER) is used to represent the mixing that occurs within a building. The air within a residence is assumed to be flushed out of the building at a rate of 13.8 times per day (0.53 times per hour) and at a commercial location at the rate of 22.32 times per day (0.93 times per hour) based on values listed by Hers et al. (2001) and Murray and Burmaster (1995). These two papers are the source of the recommendations in U.S. EPA's *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (2004).

For the J&E equations, Illinois EPA used a chemical-specific value for

Dimensionless Henry's Law Constant set to a default system temperature of 13°C. U.S. EPA's draft vapor intrusion guidance – as well as the other exposure routes in TACO – set the system temperature for Dimensionless Henry's Law Constant at 25°C. Illinois EPA decided to use a lower system temperature for the indoor inhalation route in Tiers 1 and 2 because it is more representative of the groundwater temperature in Illinois. The groundwater temperature in Illinois ranges from 8.3° C to 16.7° C; the average within that range is 13.19° C. The lower temperature reduces the Dimensionless Henry's Law Constant, resulting in a less stringent remediation objective. The States of New Jersey and Michigan also apply a state-specific system temperature (13° C and 12.5° C, respectively) for Dimensionless Henry's Law Constant under the indoor inhalation exposure route.

Section 742.Appendix B, Table G provides a Tier 1 table of numerical soil gas values for residential, industrial/commercial and construction worker receptors for the outdoor inhalation route. Section 742.Appendix B, Tables H and I provide a Tier 1 table of numerical soil gas and groundwater values for both residential and industrial/commercial receptors for the indoor inhalation route. Remediation objectives are not provided in Tables H and I for the construction worker population since this receptor group is not at risk from indoor inhalation exposure. The exposure duration for indoor construction in almost all cases is less than the exposure duration for the residents or commercial workers. Thus the protection of these two receptors will ensure protection of the construction worker during the period of indoor construction.

The November 2010 proposal makes a significant change to the Tier 1 portion of the indoor inhalation proposal with regards to the principles of advection. The August 2008 proposal did not include an advection component. U.S. EPA's concerns with Illinois EPA's 2008 proposal centered around the lack of an advection component.

In response, Illinois EPA added the advection component to the modified J&E model it uses to calculate remediation objectives for the proposed indoor inhalation exposure route. The advection component accounts for the migration of contaminants in soil gas brought about by differences in pressure gradients between the interior of a building and the soil nearest the building foundation. Illinois EPA set the parameter value used to measure advective flow, called Q_{soil}, to the U.S. EPA default number.

On May 25, 2010, Illinois EPA met with representatives from U.S. EPA Region 5 to brief them on the revisions Illinois EPA had made to the vapor intrusion proposal in response to their original comments; to answer questions and provide further explanations as needed; and, to request additional review by U.S. EPA Region 5 to obtain their concurrence with the modifications. On August 12, 2010, Illinois EPA received a letter from U.S. EPA Region 5 commenting on and recommending changes to the revised proposal.

U.S. EPA Region 5 recommended that when the Diffusion Only Table (Appendix B, Table I) is used to demonstrate compliance that compliance with both soil gas remediation objectives and groundwater remediation objectives be required. Illinois EPA agreed that multiple lines of evidence from soil gas and groundwater should be obtained prior to using Appendix B, Table I.

In addition, U.S. EPA Region 5 raised concerns about the use of a water filled soil porosity value of 30 percent as being non-representative of Illinois soil conditions. The 30 percent value is the subsurface default parameter value recommended by U. S. EPA's Soil Screening Guidance Document (1996); however, the Site Remediation Advisory Committee (SRAC) raised the same concern when meeting with Illinois EPA to discuss the changes. As a result, in the November 2010 proposal Illinois EPA adjusted the water filled soil porosity value

to 15 percent, a value more consistent with typical Illinois soils. Changing this input parameter, however, meant recalculating the remediation objectives in Appendix B, Tables H and I, lowering them (making them more conservative) by as much as 25 percent in Table H (Diffusion and Advection) and by as much as 90 percent in Table I (Diffusion Only). By using the more conservative water filled soil porosity value of 15 percent typical of Illinois soils, Illinois EPA has developed a more conservative set of screening values and no longer needs to condition use of the Tier 1 Tables based on determining site specific water filled soil porosity (as proposed in the May 2010 draft provided to U.S. EPA and SRAC).

In addition to describing Section 742.Appendix B, Tables H and I, Section 742.515 explains how these Tables are to be used. Table H is used when soil or groundwater contamination is within 5 feet of an existing or potential building or manmade pathway. Table I is used when the distance is more than 5 feet. The Table H values are more conservative than the Table I values because the Table H values reflect forces of both diffusion and advection moving contamination to the interior of a structure. Table I values are based on diffusion only. The extent of the difference in values between the Tables is contaminant specific. For some of the contaminants the difference is a few multiples; for others, it can be an order of magnitude. If Table H values are used, then compliance with Tier 1 values can be based on meeting either the soil gas remediation objectives or the groundwater remediation objectives. If Table I is used, then the Tier I values must be met for both soil gas and groundwater.

When Table I is used, it will be necessary to condition use of the site in the NFR determination such that no future buildings or manmade pathways can be located within 5 feet of the contamination. (See Section 742.1000(a)(7)) If Table H values are complied with, then that conditioning of site use is not required.

The use of indoor air data as a general method to demonstrate compliance with remediation objectives under Tier 1 or 2 was rejected early by Illinois EPA. The Agency continues that approach with the November 2010 proposal. Indoor air samples are highly susceptible to bias from occupant sources (smoking, dry cleaning, household chemical use and storage, etc.). They are also invasive, requiring site evaluators to obtain access to indoor space. The rules do not prohibit the use of indoor air data; however, any such request would be a Tier 3 evaluation. (See Section 742.935(a))

Subpart G: Tier 2 Soil Evaluation

Tier 2 remediation objectives are developed using the J&E equations provided in Section 742.Appendix C, Table L.

Tier 2 calculations require information on the physical and chemical properties of the individual contaminants at a site. As in Tier 1, a chemical's toxicological parameters, physical parameters (obtained from Section 742.Appendix C, Table E), and the J&E equations themselves may not be varied. This is also true for Tier 2 evaluations applying the SSL and RBCA models for the other exposure routes.

Section 742.Appendix C, Table M contains all of the parameters used for the J&E equations. These parameters use either default values (i.e., standardized and/or health protective values) or actual site-specific field data. Where default values are provided, they may be used in Tier 2 equations. That is, only partial site-specific information need be obtained and default values may be used for the rest of an equation's parameter inputs. This practice is consistent with Tier 2 evaluations for the other exposure routes.

Under Tier 2, the attenuation factor is based on site-specific soil properties, including: depth to contaminated soil; types of soil present beneath the ground surface and the

contamination source; and geotechnical parameters (dry soil bulk density, soil total porosity, water-filled soil porosity, and fraction organic carbon content).

Under existing Section 742.610, which will also apply to the indoor inhalation route, to determine site-specific physical soil parameters, a minimum of one boring per 0.5 acre of contamination must be collected. Each soil sample analyzed for one or more of the applicable contaminants of concern must also be analyzed for water content; at sites where multiple samples from multiple depths are analyzed for contaminants on a dry weight basis and their volumetric water content can be measured based on available data, additional samples solely for analysis of water content may not be necessary.

Samples for geotechnical data are not required from directly under the building. Samples collected adjacent to a building are acceptable. In lieu of sampling the different soil types for geotechnical parameters, use of the default soil parameters provided in TACO is also acceptable. Soil parameters obtained from other literature searches and not from site-specific determinations may be allowed under Tier 3.

The depth to contaminated media (D_{source}) is the shortest distance from the base of any existing or potential building (or man-made pathway into the building) to a location where a sample result exceeds the Tier 1 value for a contaminant of concern for the indoor inhalation exposure route.

It is essential to determine the type of soil between the ground surface and the contamination source, as the contaminants must migrate through this soil before entering a building. If the site stratigraphy varies in this zone, it should be divided into different layers. For each different soil layer, the soil type, thickness, water-filled soil porosity and soil total porosity are necessary to calculate the Tier 2 remediation objectives. Specifically, the water-filled soil

porosity and soil total porosity are used to estimate the effective diffusion coefficient for each layer. If the contaminated medium is groundwater, then the capillary fringe is included as one of the soil layers.

The geotechnical parameters – dry soil bulk density, soil total porosity, water-filled soil porosity, and fraction organic carbon content – are used to estimate soil gas concentrations at the source, assuming that the risk being calculated is based on representative soil concentrations. Methods for determining soil parameters for the indoor inhalation exposure route are provided in Section 742.Appendix C, Table F.

The most sensitive parameters are water content and thickness of the capillary fringe. Fraction of organic carbon content (f_{oc}) is also sensitive; increasing f_{oc} increases the remediation objectives. Depth to soil source is not sensitive because the modified J&E model assumes an infinite source with no biodegradation as the vapors migrate through the vadose zone.

Section 742.717 explains how the J&E equations are to be applied when calculating soil gas remediation objectives for the indoor inhalation exposure route. Equations J&E1 through J&E3 are used to calculate the acceptable concentration of the contaminant in indoor air. Equation J&E1 applies only to chemicals that cause carcinogenic health effects, J&E2 applies only to chemicals that cause noncarcinogenic health effects, and J&E3 is used by both types of contaminants to convert from parts per million volume to milligrams per cubic meter. Estimation of indoor air remediation objectives using J&E1 or J&E2 requires two categories of input parameters: toxicological information and receptor-specific exposure factors (exposure frequency, exposure duration and averaging time).

Equation J&E4 calculates a soil gas remediation objective using the appropriate indoor air remediation objective (from either J&E1 or J&E2) and an attenuation factor developed from

Equations J&E7 through J&E18. The soil gas remediation objective must be compared to the saturated vapor concentration (C_v^{sat}). Section 742.222 presents the methods by which the C_v^{sat} concentration is obtained; for example, site evaluators may use the list of C_v^{sat} values in Section 742.Appendix A, Table K or calculate a site-specific C_v^{sat} using equation J&E5. If the calculated soil gas remediation objective is greater than C_v^{sat}, then C_v^{sat} is used as the soil gas remediation objective.

When comparing the calculated soil gas remediation objective to soil gas samples from the site, Section 742.717(j) instructs site evaluators to use soil gas data collected at a depth at least three feet below the ground surface and above the saturated zone. This is to ensure the quality of the soil gas sample. Samples taken less than three feet from the ground surface can be compromised by the influence of barometric pressure fluctuations that may cause an influx of ambient air into the soil, variations in ambient temperature, and precipitation. Samples taken from the capillary fringe or below are unacceptable because of high water saturation.

The C_{sat} table in Section 742.Appendix A, Table A now has two exposure route specific columns because it uses different values for fraction organic carbon content (f_{oc}). The migration to groundwater pathway uses a f_{oc} 0.002 (mg/mg) because the contamination is moving into deeper soils with a lower organic carbon content. The outdoor inhalation exposure route uses a f_{oc} value of 0.006 because the contamination is moving up through the soils. Illinois EPA decided to use a f_{oc} value of 0.002 for the indoor inhalation exposure route because basements are below surface; using a lower f_{oc} value results in a more conservative remediation objective.

Equation J&E7 or 8 may be used to calculate the attenuation factor. This is the heart of the predictive model, measuring how much contamination from the subsurface is expected to reach the indoor air. The source of the contaminant concentrations in the subsurface may be

either soil, groundwater or soil gas. J&E8 assumes that there is no significant pressure difference between the subsurface soil and the building. This means that contaminants emanating from the source do not migrate into the building by advection. Migration by advection is represented by the parameter Q_{soil}, also known as the volumetric flow rate of soil gas into the enclosed space. When Q_{soil} is assumed to equal zero – as is the case with Appendix B, Table I – diffusion is the only contaminant transport mechanism. If advection and diffusion are the modes of contaminant transport, site evaluators would use equation J&E7 to calculate the attenuation factor.

The remaining equations, J&E9a through J&E18, are used to establish the input parameters for application in J&E7 and 8. Equation J&E9a calculates the total overall chemical-specific effective diffusion coefficient. For this equation, each layer of soil (sand, loamy sand, loam etc.) through which contaminant vapors migrate from source to building must be accounted for. The total thickness of the soil layers must equal the distance from the bottom of the slab to the top of the contamination; this relationship is presented in equation J&E9b. The distance, called the source to building separation distance, is calculated by equation J&E10.

Equation J&E11 calculates the chemical-specific effective diffusion coefficient for each soil layer and is used in equation J&E9a. Equations J&E12a and 12b are used to calculate the surface area of the enclosed space at or below grade through which vapors enter into the building. For slab-on-grade buildings, site evaluators must use J&E12a. For buildings with basements, site evaluators must use J&E12b. Equation J&E13 calculates the building ventilation rate using the air exchange rate and the size of the building. For equations J&E12a, J&E12b and J&E13, site evaluators must use the same default values as in Tier 1.

Equation J&E14 calculates the area of total cracks assumed to exist in the portion of the structure below grade through which contaminants migrate into the building; default values from

Tier 1 must be used here as well. Contaminants intrude into the building only through cracks that completely penetrate the slab; these cracks are assumed to be filled with dirt. The thickness of these cracks is represented by the slab thickness, which is set at 10 cm for both Tier 1 and Tier 2. Equation J&E15 calculates the effective diffusion coefficient through the cracks using soil parameters representative of the soil within the cracks; as these parameters cannot be measured directly, the default values in Tier 1 apply.

Equations J&E16 through J&E18 calculate site-specific geotechnical parameters. J&E16 gives the total porosity, which is the ratio of the volume of voids to the volume of soil sample. J&E17 gives the water-filled soil porosity, which is the ratio of the volume of water to the volume of soil. J&E18 gives the air-filled soil porosity, which is a measure of the total porosity minus the water-filled porosity. Porosity values representative of the soil layer at the source of contamination as well as each soil layer through which contaminants migrate are needed to calculate the effective diffusion coefficient (J&E11). Additional methods for determining the physical soil parameters are presented in Section 742.Appendix C, Table F.

It is possible to calculate a Tier 2 soil remediation objective more stringent than the Tier 1 soil remediation objective for the indoor inhalation pathway; in such cases, the Tier 1 remediation objective applies. This practice is consistent with the other exposure routes in TACO.

Subpart H: Tier 2 Groundwater Evaluation

Section 742.805(e) requires site evaluators to follow Section 742.812 in calculating groundwater remediation objectives for the indoor inhalation exposure route.

Under Section 742.812, site evaluators follow the J&E equations presented in Section 742.717, only equation J&E6 is used instead of equation J&E4, and when determining the

attenuation factor, the capillary fringe must be considered one of the layers in equation J&E9a.

The capillary fringe is the zone immediately above the saturated zone where capillary attraction causes upward movement of water molecules from the saturated zone into the soil above; it contains more water than the rest of the soil above the water table. This zone is distinct in that it has characteristics of both the vadose and saturated zones. Because the capillary fringe impacts the migration of contaminants from the water table, it must be considered as a separate soil layer when developing remediation objectives for groundwater and a default thickness of 37.5 cm must be used. This value comes from the U.S. Soil Conservation Service soil texture classification table, which is also used by U.S. EPA for determining soil-dependent properties for the J&E model. In addition, the default water-filled soil porosity of the capillary fringe is assumed to be 90 percent of the total porosity of the soil that comprises the capillary fringe. The thickness of the capillary fringe and its water-filled soil porosity cannot be measured accurately in the field on a site-specific basis, which is why site-specific values are not allowed.

Subpart I: Tier 3 Evaluation

Section 742.900(c)(10) identifies the use of building control technologies – different from those presented in Subpart L – as a situation eligible for a Tier 3 evaluation. Site evaluators wanting to perform a Tier 3 evaluation for reasons of impractical remediation (Section 742.920) or exposure route exclusion (Section 742.925) for the indoor inhalation pathway are directed to follow Section 742.935.

Under Section 742.935, site evaluators may propose to exclude the exposure route; to use building control technologies different from those presented in Subpart L; to use calculations and modeling to establish soil gas remediation objectives; and to use calculations and modeling to establish soil remediation objectives.

Section 742.935(a) has changed substantially from the August 2008 proposal. The August 2008 version focused on the use of Qsoil where contaminants were within 5 feet of a building or manmade pathway. That discussion was made irrelevant by the addition of Appendix B, Table H and the amendments to Section 742.515. The November 2010 version is more open ended in terms of the types of Tier 3 proposals that can be considered.

Section 742.935(b) must be used when site evaluators propose a mitigation system that deviates from the building control technology requirements presented in Subpart L. This section identifies what information a site evaluator must submit to Illinois EPA to demonstrate the effectiveness of an alternative building control technology to prevent or mitigate indoor inhalation exposure risks.

In Section 742.935(c), site evaluators may propose to establish remediation objectives using soil gas data in lieu of the requirements of Section 742.227. One such difference is the use of sub-slab samples collected directly beneath a building foundation. Section 742.227 applies to exterior samples collected near the building, which is Illinois EPA's preferred approach as it is the least invasive. However, because sub-slab sampling is an accepted methodology nationwide, Illinois EPA decided to reference it specifically under Tier 3. This section identifies what information a site evaluator must submit to Illinois EPA to demonstrate the validity of alternative soil gas data in calculating indoor inhalation remediation objectives.

As noted earlier in my testimony, the Agency has dropped from Tier 1 and the Tier 1 Indoor Inhalation Tables (Appendix B, Tables H and I) the concept of using soil remediation objectives as a general methodology for predicting indoor inhalation risks. Here in Section 742.935(d) the Agency has left open the potential for a site evaluator to make a site specific demonstration that a soil remediation objective can be a meaningful predictor of indoor

inhalation risk. Of critical importance in this regard will be the ability of a site evaluator to make the mathematical and technical justification for the proposed model. (Section 742.935(d)(6))

Subpart J: Institutional Controls

In my earlier discussion of Tier 1 remediation objectives I noted that if a site evaluator uses Appendix B, Table I (Diffusion Only) then an institutional control must be placed to limit location of buildings and manmade pathways. Section 742.1000(a)(7) makes it clear that any time the diffusion only mode of transport is used (whether under Tier 1, 2, or 3) an institutional control will be necessary. Following is an example of an institutional control that could be included with the NFR determination when Appendix B, Table I (Diffusion Only) is used:

No building shall be constructed or occupied with the basement or lowest level X feet below the ground surface in the area indicated on the site base map.

The "X" referenced in the example above represents the distance that must be maintained to prevent the lowest level of the building from being located within 5 feet of the soil and groundwater contamination. Contamination located closer than 5 feet may exhibit an increased migration rate into the indoor space due to a pressure differential from the building. This would result in soil gas or groundwater remediation objectives that are not protective.

Section 742.1000(a)(8) requires the use of institutional controls whenever remediation objectives are based on a building control technology. Following is an example of an institutional control that could be included with the NFR determination when a building control technology is used:

No building shall be occupied in the area indicated on the site base map unless building control technologies are in place complying with 742 Subpart L: Building Control Technologies.

In some cases the site evaluator may request that a complete prohibition from buildings be a condition of the No Further Remediation determination. With the majority of sites, however, we expect that an institutional control like the one above will be preferred. This control would allow for the future construction and occupancy of buildings that have the appropriate Building Control Technologies provided in Subpart L.

Section 742.1015(j) prohibits the use of a groundwater ordinance to exclude the indoor inhalation exposure route. As described previously, an ordinance restricting the source of drinking water would not protect the enclosed air space of a building from the migration of contaminants in the groundwater.

Subpart L: Building Control Technologies

Building control technologies are designed to prevent the migration of volatile chemicals into enclosed spaces. They control unacceptable health risks due to vapor intrusion by reducing or eliminating the concentrations in the indoor air without necessarily reducing the residual concentrations in soil gas or groundwater. The objective of these measures is to make the indoor inhalation exposure route incomplete by preventing the migration of chemicals into a building. The November 2010 proposal duplicates the August 2008 proposal, except for the inclusion of an additional building control technology, vented raised floors in Section 742.1210(c)(4).

Section 742.1200 establishes the use of building control technologies as an acceptable final corrective action and requires that the site evaluator also comply with the provisions of Subpart J regarding institutional controls. This Section allows for no further remediation determinations to be made on building control technologies for buildings not yet constructed, provided that the approved technology is in place and operational before human occupancy. Site

owners and operators are required to maintain building control technologies; specific maintenance duties will be contained in the institutional control. In the event that the system shuts down, site owners and operators are required to notify building occupants and workers and implement protective measures to prevent exposure to the contaminants of concern. System inoperability may occur during routine maintenance or power failures. Contingency measures will be contained in the institutional control; this practice is consistent with provisions in place for engineered barriers used by the other exposure routes. Lastly, this Section states that the no further remediation determination may be voided if the building control technology is not maintained as stipulated in the institutional control.

Section 742.1205 lists the information to be submitted in a proposal to use any of the four mitigation systems under Subpart L.

Section 742.1210 defines the specific requirements for four mitigation systems: sub-slab depressurization, sub-membrane depressurization, membrane barrier systems, and vented raised floors. This Section specifically prohibits natural attenuation, access controls and point of use treatment from use as building control technologies. Also, building control technologies cannot be used as part of a Tier 1 evaluation.

Sub-slab depressurization is an active venting system that draws contaminated soil gas from beneath the building and expels it to the atmosphere. Sub-slab depressurization systems can be used for existing and new buildings. Sub-membrane depressurization is similar to the sub-slab depressurization system, but used for existing buildings with crawl spaces.

Membrane barrier systems are generally used for new building construction and serve to physically block the entry of contaminants into interior air space.

Vented raised floors have interconnected void systems that passively vent air flows from

beneath a slab to the outdoor air with the capability to convert to an active depressurization system. Vented raised floors are generally used in new building construction.

This concludes my testimony.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO:	)	
TIERED APPROACH TO CORRECTIVE	)	R11-9
ACTION OBJECTIVES	)	(Rulemaking-Land)
(35 Ill. Adm. Code 742)	)	

PRE-FILED TESTIMONY OF TRACEY HURLEY

Qualifications

My name is Tracey Hurley. I am an Environmental Toxicologist with the Toxicity Assessment Unit at the Illinois Environmental Protection Agency ("Illinois EPA"). I have been with the Illinois EPA for twenty-four years. I have been a member of the Illinois EPA's workgroups that developed the original 35 Ill. Adm. Code Part 742 rule, Tiered Approach to Corrective Action Objectives ("TACO", R97-12) and subsequent amendments.

I was a member of the Agency's workgroup that developed the original 35 Ill. Adm. Code Part 620 rule, Groundwater Quality Standards (PCB R89-14).

I have a Bachelor of Science degree in Biology and a Master of Public Health degree.

Testimonial Statement

I will be testifying in support of the proposed amendments to 35 Ill. Adm. Code 742: Tiered Approach to Corrective Action Objectives. I will present an overview of the updates to the tables in Appendices A, B, and C and Errata Sheet 1.

There are four main explanations for the revisions to the tables: 1) changes in the physical and chemical parameters, 2) changes in the toxicity values, 3) addition of

chemicals as a result of their inclusion in the proposed Groundwater Quality Standards (35 Ill. Adm. Code 620, R08-18), and 4) addition of the Indoor Inhalation exposure pathway. Rick Cobb and Tom Hornshaw, Illinois EPA, provided testimony on the addition of chemicals to the proposed Groundwater Quality Standards during the Part 620 hearings (R08-18). (See pages 11 – 17 of Rick Cobb's pre-filed testimony, pages 5 – 7 of Tom Hornshaw's pre-filed testimony, questions and responses numbers 2, 17, and 18 from the supplemental testimony of Richard P. Cobb and Thomas C. Hornshaw.) Gary King, Illinois EPA, will provide more detailed testimony on the Indoor Inhalation exposure pathway. I will first describe the basis of the physical and chemical parameters and toxicity values in more detail before I discuss the changes to the tables.

Physical and Chemical Parameter Values

The Tier 1 Remediation Objectives for the indoor inhalation route have been calculated using updated physical and chemical parameter values and toxicity values for several of the chemicals. The revised physical and chemical parameter values are the result of updates in the sources the Illinois EPA uses for this information. These sources include the following online databases: USEPA's Superfund Chemical Data Matrix, (SCDM), CHEMFATE, PhysProp, USEPA's Water9 software for diffusivity values, and *Handbook of Environmental Degradation Rates* by P.H. Howard (1991) for first order degradation constant values. The SCDM database and Water software were used by USEPA in developing the Soil Screening Levels (SSL). The CHEMFATE and PhysProp databases are the original sources for some of the information in the SCDM database. Howard (1991) also was used by USEPA in developing the Soil Screening Levels.

We have added a footnote to the end of the title of Appendix C, Table E, proposed

footnote "e". Footnote "e" reads: "The values in this table were taken from the following sources (in order of preference): SCDMS online database (http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm); CHEMFATE online database (http://www.srcinc.com/what-we-do/databaseforms.aspx?id=381); PhysProp online database (http://www.srcinc.com/what-we-do/databaseforms.aspx?id=386); Water9 (http://www.epa.gov/ttn/chief/software/water/) for diffusivity values; and *Handbook of Environmental Degradation Rates* by P.H. Howard (1991) for first order degradation constant values."

Toxicity Values

On December 5, 2003, USEPA issued a memorandum (OSWER Directive 9285.7-53) from Michael B. Cook, Director of the Office of Superfund Remediation and Technology Information, to the Superfund National Policy Managers, Regions 1-10, on Human Health Toxicity Values in Superfund Risk Assessments. As a result, several of the toxicity values changed and some new values were added. As discussed by Tom Hornshaw during the Part 620 hearings (R08-18) pages 2 – 4 of his pre-filed testimony, this memo revised the hierarchy for selecting human health toxicity values that had been used since the issuance of the original hierarchy in the 1989 Risk Assessment Guidance for Superfund (RAGS). The RAGS hierarchy, which has also been used by the Toxicity Assessment Unit in developing human health toxicity values, was to first use values from USEPA's Integrated Risk Information System (IRIS) database, if available; otherwise, values from the most recent Health Effects Assessment Summary Tables (HEAST) were to be used. If no toxicity value was available from either of these sources, then values could be derived from literature sources or a request could be made to USEPA's National

Center for Environmental Assessment (NCEA) for provisional toxicity values.

The revised hierarchy still specifies the IRIS database as the first option for toxicity values, but now includes second and third tiers of data sources. The second tier is a recently introduced database, USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs), available from NCEA. The third tier, Other Toxicity Values, includes three named sources but could also include other sources as appropriate. The three named sources are the Agency for Toxic Substances and Disease Registry's (ATSDR) Minimal Risk Levels (MRLs), developed for ATSDR risk assessments; California EPA's toxicity values, developed to support various rules and programs; and USEPA's HEAST, which was last updated in 1997.

The Toxicity Assessment Unit has adopted this hierarchy, with some minor revisions, as the basis for determining the toxicity values for its activities. As we began using the new hierarchy, we became aware of some minor issues that ultimately lead to certain revisions of the hierarchy. Three issues that resulted in a minor revision are:

- PPRTVs are given an "eligible for update" date by USEPA, leading us to question what should be the role of these PPRTV values after this specified date; we ultimately decided to continue using them instead of going to tier three.
- PPRTVs for some chemicals contain some screening level toxicity values in an appendix. If information is available for a chemical that, although insufficient to support derivation of a provisional toxicity value, may be of limited use to risk assessors, a screening value is developed. These screening values are available in an appendix and receive the same level of internal and external scientific peer review as the PPRTV documents. Therefore, we decided to consider these values

but give them lesser weight than a PPRTV provisional toxicity value by considering them in tier three.

- USEPA's hierarchy does not provide guidance on which value to use if more than one value is available from the three named sources in tier three. We decided to follow the same order from USEPA's Regional Screening Levels website (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm): ATSDR chronic MRL, California EPA chronic toxicity value, chronic toxicity value from a PPRTV appendix, or chronic toxicity value from HEAST.
- IRIS does not contain values for subchronic exposures, only values for chronic exposures, so there is essentially no first tier for shorter-duration exposures; however, some chronic IRIS values use an Uncertainty Factor to extrapolate to chronic exposures from a study of subchronic duration, and we have used the IRIS value with this Uncertainty Factor removed as the first tier when available.

The toxicity parameters, their values, and the sources of these values are listed on the Illinois EPA website. The tables on the website are updated on a quarterly basis. We refer users of TACO to the website to ensure that they have the most current information. Therefore, we are proposing the following changes: For the symbols RfC, RfD_o, SF_o, URF in Appendix C, Table B, the Source column will now read "Illinois EPA (http://www.epa.state.il.us/land/taco/toxicity-values.xls)". The same source is listed for the symbols RfC and URF in Appendix C, Table M.

The OSWER Directive 9285.7-53 has been added to the Incorporations by Reference, Section 742.210. The reference to IRIS has been removed and the OSWER Directive 9285.7-53 added in its place in Sections 742.705(d)(2), 742.710(c)(2),

742.710(c)(3), and 742.715(b)(2).

Appendix A

Table A has an added column for the Soil Saturation Concentration ("C_{sat}") values for the Soil Component of the Groundwater Ingestion Exposure Route. In the process of updating the tables, we realized that each chemical actually has two different C_{sat} values, one for the Outdoor Inhalation Exposure Route and one for the Soil Component of the Groundwater Ingestion Exposure Route. These exposure routes assume different default fraction organic carbon content of soil ("foc") values as listed in Appendix C, Table B. The Soil Component of the Groundwater Ingestion Exposure Route uses an foc value of 0.002 g/g because it is modeling a contaminant that is moving into deeper soils with a lower organic carbon content. The Outdoor Inhalation Exposure Route uses 0.006 g/g because it is modeling a contaminant that is moving through surface soils with a higher organic carbon content. The C_{sat} values listed in Appendix A, Table A of the 2007 version of TACO are actually for the Outdoor Inhalation Exposure Route only. It was an oversight that C_{sat} values for the Soil Component of the Groundwater Ingestion Exposure Route were not included also.

The C_{sat} values listed in Appendix A, Table A have been calculated with the updated Solubility, Organic Carbon Partition Coefficient ("K_{oc}"), and Dimensionless Henry's Law Constant ("H'") properties of the chemicals. The C_{sat} values were calculated using equations S19 and S29 in Appendix C, Table A. The physical and chemical properties used in the equations are listed in Appendix C, Table E. Three footnotes have been added. Footnote "a" specifies that the C_{sat} values were calculated using an foc of 0.006 g/g and a system temperature of 25°C. The values with a "b"

footnote were calculated using an foc of 0.002 and a system temperature of 25°C. Footnote "c" specifies that the C_{sat} was calculated at a pH of 6.8. If a site's soil pH is a value other than 6.8, then a site-specific C_{sat} should be calculated using equations S19 and S29 and the pH-specific K_{oc} values listed in Appendix C, Table I. The K_{oc} values for ionizing organic chemicals will vary with pH. The footnotes are new, but the practices are not.

Tables E and F have been updated with fourteen new chemicals. These are the same chemicals that have been added to the proposed Groundwater Quality Standards (35 Ill. Adm. Code 620, R08-18). The target organs have been updated to reflect new toxicity information. Additionally, the tables have been alphabetized by target organ.

Table J is a new table containing a list of volatile chemicals that must be considered for the indoor inhalation route. "Volatile chemical" is defined in 742.200 as a chemical with an H' value greater than 1.9×10^{-2} or a vapor pressure greater than 0.1 Torr (mm Hg) at 25°C and elemental mercury. USEPA, in its "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils" (November 2002), defines a volatile chemical as having a Henry's Law Constant greater than 10^{-5} atm m^3/mol (equivalent to an H' value of 4.1×10^{-4}). The existing TACO definition for volatile organic compounds is based on SW-846 analytical methods or a boiling point less than 200 °C and a vapor pressure greater than 0.1 Torr (mm Hg) at 25°C. We felt that having two separate definitions for volatile chemicals, one for the indoor inhalation pathway using USEPA's definition and one for the other pathways, would be too confusing. In addition, USEPA's definition includes many polynuclear aromatic hydrocarbons (such as acenaphthene and chrysene) that really do not volatilize

in a significant amount. In order to reconcile the two definitions, we looked at certain physical-chemical properties of the chemicals and whether these properties determined if the chemical was analyzed by an SW-846 method for volatiles or analyzed as a semi-volatile.

The physical-chemical properties we examined included vapor pressure, boiling point, H', molecular weight, and the log of the octanol-water partition coefficient ("logP"). logP is used to calculate K_{oc}. There did not appear to be a relationship between boiling point, molecular weight, and logP to the analytical method for the chemical. It appears that chemicals with a vapor pressure greater than 0.1 Torr (mm Hg) at 25°C are primarily analyzed as volatiles. However, this criterion does not classify naphthalene as a volatile. We wanted to include naphthalene in the definition of a volatile chemical because it can be analyzed either as a volatile chemical (using SW-846 method 8260) or as a semi-volatile (using SW-846 method 8270). Naphthalene generally is considered to exhibit characteristics of both a volatile chemical and a semi-volatile chemical and it does volatilize. Therefore, following USEPA's lead, we decided to include H' in the definition of volatile chemical. We chose a value for H' of 1.9×10^{-2} in order to include naphthalene (H' of 1.98×10^{-2}). Elemental mercury was specifically included in the definition of volatile chemical because it is volatile and has outdoor inhalation remediation objectives already in TACO.

Table K is another new table. It lists the Soil Vapor Saturation Concentration ("C_v^{sat}") values for the volatile chemicals. The C_v^{sat} values have been calculated using equation J&E5 from Appendix C, Table L, the default parameters listed in Appendix C, Table M, and the physical and chemical parameters listed in Appendix C, Table E.

Appendix B

Table G is a new table. In it are listed the Soil Gas Remediation Objectives for the Outdoor Inhalation Exposure Route for Residential, Industrial/Commercial, and Construction Worker receptors for the 59 volatile chemicals. The Remediation Objectives have been calculated using the new equation S30 listed in Appendix C, Table A, the default parameters listed in Appendix C, Table B, and the Tier 1 soil remediation objectives from the 2007 version of TACO (adopted in R06-10). The chemical-specific values for C_v^{sat} are listed in Appendix A, Table K, and physical/chemical parameters are listed in Appendix C, Table E. If the calculated Tier 1 soil gas remediation objective exceeds the C_v^{sat} value of the chemical, the C_v^{sat} value is shown as the remediation objective. Capping the remediation objectives in this way precludes a two-phase system, or free product. The models used in TACO are invalid if there are two phases.

The C_v^{sat} value of the chemical is listed as the remediation objective if there are no inhalation toxicity values for the chemical. Inhalation toxicity values were not available for ten volatile chemicals: acetone, bromodichloromethane, butanol, chlorodibromomethane, 2-chlorophenol, dalapon, cis-1,2-dichloroethylene, hexachloroethane (for residents and industrial/commercial workers), 2-methylnaphthalene, and 1,1,2-trichloroethane. Tier 1 soil gas remediation objectives developed for these chemicals are set at the soil vapor saturation limit calculated using the Tier 1 default values. Illinois EPA decided to use this approach rather than using the oral toxicity values because extrapolating oral toxicity values is not appropriate. The chlorinated solvents are metabolized in the liver when they are ingested but not when they are inhaled. This means that the amount of chemical or form or both and,

ultimately, the toxicity, of the chemical that is circulating in the body is going to be different for inhalation and ingestion exposures. By not substituting oral toxicity values for missing inhalation toxicity values Illinois EPA is consistent with USEPA's *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) Final,* as incorporated by reference in Section 742.210.

Tables H and I are both new tables. They list the soil gas and groundwater remediation objectives for the indoor inhalation exposure route for residential and industrial/commercial receptors. The remediation objectives in Table H are calculated using both diffusive and advective transport mechanisms while Table I remediation objectives are calculated using diffusion only as the transport mechanism through soil. Both Table H and Table I remediation objectives were calculated using toxicity values from the hierarchy discussed earlier, physical/chemical values listed in Appendix C, Table E, the J&E equations listed in Appendix C, Table L, and the default parameter values listed in Appendix C, Table M. As in Table G, if the calculated Tier 1 soil gas remediation objective exceeds the C_v^{sat} value of the chemical or if there are no inhalation toxicity values, the C_v^{sat} value is shown as the remediation objective. Similarly, if the calculated groundwater remediation objective exceeds the solubility of the chemical in water (listed in Appendix C, Table E) or there are no oral toxicity values available, the solubility limit becomes the remediation objective. The chloroform groundwater remediation objective for residential receptors is the Groundwater Quality Standard listed in 35 Ill. Adm. Code 620, Section 620.410 (R08-18). The calculated remediation objective for chloroform was lower than its Groundwater Quality Standard. Illinois EPA

made a decision that groundwater remediation objectives for the indoor inhalation route of exposure should not be lower than the Groundwater Quality Standards or the groundwater remediation objectives for the groundwater ingestion exposure route. We feel that standards or objectives based on protecting people who may directly ingest the chemical in drinking water should be sufficiently protective of people who may be exposed through the indoor inhalation route.

Appendix C

Table A has a new equation, S30. This equation is used to calculate the soil gas remediation objectives for the outdoor inhalation exposure route listed in Appendix B, Table G. Equation S30 uses the soil remediation objectives for the outdoor inhalation route of exposure and converts them to soil gas remediation objectives using an equilibrium conversion which assumes that the soil gas is in three phase equilibrium with the contaminated soil at the source. This calculation takes into account soil-specific properties – water-filled soil porosity, the soil-water partition coefficient, the air-filled soil porosity, and the dry soil bulk density – and uses a chemical-specific Dimensionless Henry's Law Constant set at a system temperature of 13°C (as in Tier 1 indoor inhalation exposure route).

In Table B the source of the toxicity values has been changed from IEPA (IRIS/HEAST) to Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls. As discussed previously in my testimony, USEPA's latest hierarchy (OSWER Directive 9285.7-53, December 5, 2003) for Human Health Toxicity Values no longer lists only IRIS and HEAST. There are three tiers of available sources. To simplify the source, we have just listed Illinois EPA's TACO website.

Table E lists updated Default Physical and Chemical Parameters. The 14 new chemicals from the proposed Groundwater Quality Standards (R08-18) have been added. All values are now expressed in scientific notation for ease of readability. The sources for the physical and chemical parameter values include the online databases: USEPA's Superfund Chemical Data Matrix System, CHEMFATE, PhysProp, USEPA's Water9 software for diffusivity values, and *Handbook of Environmental Degradation Rates* by P.H. Howard (1991) for first order degradation constant values. These sources are listed in new footnote "e".

Table F has been updated to include the J&E equations to the "Method" column for the parameters of total soil porosity, air-filled soil porosity, and water-filled soil porosity.

Table L is a new table that includes all of the equations required for the J&E model. Gary King, Illinois EPA, will provide testimony on the modified J&E equations.

Table M includes the parameters and default values used in the J&E equations. Gary King also will provide a more in depth discussion of these.

The equations from Table L and the parameters and default values in Table M were used to generate the Tier 1 Indoor Inhalation Remediation Objectives listed in Appendix B, Tables H and I.

Errata Sheet Number 1

This part of my testimony concerns the changes made in Errata Sheet Number 1, which is being filed concurrently with Illinois EPA's pre-filed testimony.

Two additional documents are being added to the list of Incorporations by Reference in Section 742.210. The first document is "API. American Petroleum Institute,

1220 L Street, NW, Washington, DC 20005-4070 (202) 682-8000. 'BIOVAPOR – A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0 (January 2010).'" The Biovapor model is a method that can be used to demonstrate biodegradation under Section 742.312(b)(1)(C). The second document is "Illinois Environmental Protection Agency, 1021 N Grand Ave East, Springfield, IL 62702 (217) 785-0830. 'A Summary of Selected Background Conditions for Inorganics in Soil,' Publication No. IEPA/ENV/94-161, August 1994." This document is the basis for the concentrations of inorganic chemicals in background soils listed in Appendix A, Table G.

Also in Section 742.210, the reference to "Risk Assessment Guidance for Superfund, Volume I; Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment Interim Guidance", Draft (August 18, 1992)" should be deleted. The final version of this guidance has been proposed for addition to the Incorporations by Reference.

The reference to a previous subsection in Section 742.505(c)(4) should read "If the conditions of subsection (c)(3) of this Section are not met, the Class I groundwater remediation objectives set forth in Appendix B, Table E shall be corrected for the cumulative effect of mixtures of similar-acting chemicals using the following methodologies." The subsection lettering was changed but the corresponding change to the reference was not made.

In Appendix B, Tables G, H, and I, the CAS No. for 1,2-Dichloropropane should be changed to78-87-5. It is incorrectly listed as 78-97-5.

In Appendix C, Table E, the footnote for PCBs for the Dimensionless Henry's Law Constant (H') at 13°C indicates that PCBs are not volatile. Some PCBs do meet the

definition of volatile chemical in Section 742.200. Therefore, we are changing the footnote from "b" to "a". In footnote "a", we are changing the reference to Tier 2 so that it includes Tier 3, correcting the incorporation by reference, and adding a sentence to the end. Footnote "a" should now read "Soil remediation objectives are determined pursuant to 40 CFR 761, as incorporated by reference at Section 742.210(b) (the USEPA "PCB Spill Cleanup Policy"), for most sites; persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired. PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical parameters depend on the congeners present at the site."

While the requirements of 40 CFR 761 apply to soil remediation objectives, they do not apply to soil gas or groundwater remediation objectives. Calculation of a single soil gas or groundwater remediation objective for the indoor inhalation exposure route for PCBs is complicated by the fact that PCBs are a mixture of different congeners, the congeners have different physical/chemical parameter values and toxicity values, and only some of the congeners are volatile. Therefore, Illinois EPA is replacing footnote "d" in Appendix B, Tables G and H and footnote "e" in Appendix B, Table I to read "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."

In Appendix C, Table M, the parameter value for Theta A (θ_a) should be 0.28 cm^3/cm^3, not 0.13 cm^3/cm^3. When Illinois EPA changed the Theta W (θ_w) to 15 percent, a corresponding change should have been made to θ_a so that θ_a and θ_w values added

together equal the total soil porosity value (Theta T, θ_T). The correct value for θ_a of 0.28 cm^3/cm^3 was used in calculating the remediation objectives.

This concludes my testimony.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R11-9
PROPOSED AMENDMENTS TO	)	(Rulemaking-Land)
TIERED APPROACH TO CORRECTIVE	)	
ACTION OBJECTIVES	)	
(35 Ill. Adm. Code 742)	)	
	)	

ERRATA SHEET NUMBER 1

NOW COMES the Illinois Environmental Protection Agency ("Illinois EPA") through one of its attorneys, Kimberly Geving, and submits this ERRATA SHEET NUMBER 1 to the Illinois Pollution Control Board ("Board") and the participants on the Service List. Tracey Hurley has provided testimony in support of these changes in her pre-filed written testimony, which is also being served upon the Board and the Service List.

Section	
742.210(a)	Add two new incorporations by reference and strike a third. API. American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005-4070 (202) 682-8000. "BIOVAPOR-A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0 (January 2010)." Illinois Environmental Protection Agency, 1021 N Grand Ave East, Springfield, IL 62702 (217) 785-0830. "A Summary of Selected Background Conditions for Inorganics in Soil, Publication No. IEPA/ENV/94-161, August 1994." ~~"Risk Assessment Guidance for Superfund, Volume I; Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment Interim Guidance", Draft (August 18, 1992).~~
742.505(~~b~~c)(4)	If the conditions of subsection (c)(3) ~~(b)(3)~~ of this Section are not met, the Class I groundwater remediation objectives set forth in Appendix B, Table E shall be corrected for the cumulative effect of mixtures of similar-acting chemicals using the following methodologies:

App. B, Table G App. B, Table H App. B, Table I	Change the CAS No. for 1,2-Dichloropropane from 78-97-5 to 78-87-5. It was a typographical error in all three of those tables.
App. B, Table G	Replace footnote "d" in its entirety with the following language: "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."
App. B, Table H	Replace footnote "d" in its entirety with the following language: "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."
App. B, Table I	Replace footnote "e" in its entirety with the following language: "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."
App. C, Table E	In the column entitled "Dimensionless Henry's Law Constant (H')(13°C) for the chemical Polychlorinated biphenyls (PCBs), change the footnote "b" to footnote "a."
App. C, Table E	Replace the existing language for footnote "a" with the following language: "Soil remediation objectives are determined pursuant to 40 CFR 761, as incorporated by reference at Section 742.210(b)(the USEPA "PCB Spill Cleanup Policy"), for most sites; persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired. PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical parameters depend on congeners present at the site."
App. C, Table M	Replace the Tier 1 parameter value for Θ_a so that it reads "0.28 or Calculated Value" and not "0.13 or Calculated Value."

Respectfully submitted,

ILLINOIS ENVIRONMENTAL
PROTECTION AGENCY

By: Kimberly A. Geving
Kimberly A. Geving
Assistant Counsel

DATE: January 27, 2011

1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
(217)782-5544

STATE OF ILLINOIS)
)
COUNTY OF SANGAMON)

PROOF OF SERVICE

I, the undersigned, on oath state that I have served the attached Motion for Acceptance, Pre-filed Written Testimony of Gary P. King and Tracey Hurley, Errata Sheet Number 1, and two additional Incorporations by Reference (to the Clerk of the Board only) upon the persons to whom they are directed, by placing a copy of each in an envelope addressed to:

Clerk
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601

Mitchell Cohen
Chief Legal Counsel
Illinois Dept. of Natural Resources
One Natural Resources Way
Springfield, Illinois 62702-1271

Matthew J. Dunn, Chief
Environmental Enforcement/Asbestos
Illinois Attorney General's Office
Litigation Division
69 W. Washington Street, 18th Floor
Chicago, Illinois 60602

Richard McGill, Hearing Officer
Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph, Suite 11-500
Chicago, Illinois 60601

Participants on Service List

and mailing them (First Class Mail) from Springfield, Illinois on January 27, 2011 with sufficient postage affixed as indicated above.

Kimberly A. Grving

SUBSCRIBED AND SWORN TO BEFORE ME
This 27th day of January, 2011.

Brenda Boehner, Notary Public

"OFFICIAL SEAL"
BRENDA BOEHNER
NOTARY PUBLIC
STATE OF ILLINOIS
MY COMMISSION EXPIRES 11-14-2013

		(see Clerk's Office)	
11/18/2010	Order	Order of the Board by T. E. Johnson: Accept rulemaking proposal for hearing	
11/18/2010	Appearance	Appearance of Alec M. Davis for Illinois Environmental Regulatory Group (electronic filing)	
11/9/2010	Initial Filing	Proposed Amendments (< 4MB, 172 Pages)	
11/9/2010	Initial Filing	Motion for Acceptance; Appearance of Kimberly A. Geving; Certification of Origination; Statement of Reasons; and List of Studies and Reports Used in Regulatory Development	

Service List

Party Name	Address	City/State/Zip	Phone/Fax
IEPA **Petitioner** • Kimberly A.Geving - Assistant Counsel	1021 North Grand Avenue East P.O. Box 19276	Springfield IL 62794-9276	217/782-5544 217/782-9807
Hodge Dwyer & Driver **Complainant** • Katherine D. Hodge • Monica T. Rios	3150 Roland Avenue Post Office Box 5776	Springfield IL 62705-5776	217/523-4900 217/523-4948
Mayer, Brown LLP **Interested Party** • Kevin G. Desharnais	71 South Wacker Drive	Chicago IL 60606-4637	312/782-0600 312/701-7711
Sidley Austin LLP **Interested Party** • William G. Dickett	One South Dearborn Suite 900	Chicago IL 60603	312/853-7000 312/853-7036
EPI **Interested Party** • Bob Mankowski	16650 South Canal	South Holland IL 60473	
Illinois Environmental Regulatory Group **Interested Party**	215 East Adams Street	Springfield IL 62701	217/522-5512 217/522-5518

• Alec M. Davis			
Chemical Industry Council of Illinois **Interested Party** • Lisa Frede	1400 East Touhy Avenue Suite 110	DesPlaines IL 60019-3338	
Bellande & Sargis Law Group, LLP **Interested Party** • Mark Robert Sargis	19 South LaSalle Street Suite 1203	Chicago IL 60603	312/853-8701 312/853-8702
Hanson Engineers, Inc. **Interested Party** • Tracy Lundein	1525 South Sixth Street	Springfield IL 62703-2886	217/788-2450 217/788-2503
Conestoga-Rovers & Associates **Interested Party** • Douglas G. Soutter	8615 West Bryn Mawr Avenue	Chicago IL 60631	773/380-9933 773/380-6421
Office of the Attorney General **Interested Party** • Matthew J. Dunn - Division Chief	Environmental Bureau 69 W. Washington, 18th Floor	Chicago IL 60602	312/814-0660 312/814-2347
Seyfarth Shaw **Interested Party** • Craig B. Simonsen - Paralegal • Phil Comella	131 South Dearborn Street Suite 2400	Chicago IL 60603-5803	312/460-5000 312/460-7000
Navy Facilities and Engineering Command **Interested Party** • Mark Schultz - Regional Environmental Coordinator	201 Decatur Avenue Building 1A	Great Lakes IL 60088-2801	847/688-2600 847/688-2319
Illinois Pollution Control Board **Interested Party** • - Clerk of the Board • Richard McGill - Hearing Officer	100 W. Randolph St. Suite 11-500	Chicago IL 60601	312/814-3620 312/814-3669
Commonwealth Edison **Interested Party** • Diane H. Richardson	10 South Dearborn Street 35FNW	Chicago IL 60603	
Weaver Boos & Gordon	2021 Timberbrook	Springfield IL 62702	

Interested Party • Elizabeth Steinhour	Lane		
Andrews Environmental Engineering **Interested Party** • Kenneth W. Liss	3300 Ginger Creek Drive	Springfield IL 62711	
Missman Stanley & Associates **Interested Party** • John W. Hochwarter • Jeffrey Larson	333 East State Street	Rockford IL 61110-0827	
Trivedi Associates, Inc. **Interested Party** • Chetan Trivedi	2055 Steeplebrook Court	Naperville IL 60565	
Illinois Department of Natural Resources **Interested Party** • Stan Yonkauski • Mitchell Cohen - General Counsel	One Natural Resources Way	Springfield IL 62702-1271	217/782-1809 217/524-9640
Suburban Laboratories, Inc. **Interested Party** • Jarrett Thomas - V.P.	4140 Litt Drive	Hillside IL 60162	708-544-3260
Illinois Department of Transportation **Interested Party** • Steven Gobelman	2300 S. Dirksen Parkway Room 302	Springfield IL 62764	
McGuire Woods LLP **Interested Party** • David Rieser	77 W. Wacker Suite 4100	Chicago IL 60601	312/849-8100
Reott Law Offices, LLC **Interested Party** • Raymond T. Reott • Jorge T. Mihalopoulos	35 East Wacker Drive Suite 650	Chicago IL 60601	312/332-7544
Environmental Management & Technologies, Inc. **Interested Party** • Craig Gocker - President	3010 Gill Street	Bloomington IL 61704	309/661-2300 309661-2306

Chicago Department of Law **Interested Party** • Charles A. King - Assistant Corporation Counsel	30 N. LaSalle Street Suite 900	Chicago IL 60602	312/742-3990 312/744-6798
SRAC **Interested Party** • Harry Walton	2510 Brooks Drive	Decatur IL 62521	
Burns & McDonnell Engineering Company, Inc. **Interested Party** • Lawrence L. Fieber - Principal	210 South Clark Street, Suite 2235 The Clark Adams Building	Chicago IL 60603	6306751625

Total number of participants: 28

Notice List

Party Name	Address	City/State/Zip	Phone/Fax
Drinker Biddle & Reath **Interested Party** • Sheila H. Deely • Stephanie Jackson	191 N. Wacker Drive Suite 3700	Chicago IL 60606-1698	312/569/1000 312/569-3000
Jones, Day, Reavis & Pogue **Interested Party** • LaNail C. Griffin	77 West Wacker Drive	Chicago IL 60601-1692	312/782-3939 312/782-8585
Illinois Power Company **Interested Party** • Brian Martin	500 South 27th Street P.O. Box 511	Decatur IL 62525-1805	217/424-6833
Hinshaw & Culbertson **Interested Party** • Jon S. Faletto	416 Main Street 6 th Floor	Peoria IL 61602	309/674-1025 309/674-9328
Mohan, Alewelt, Prillaman & Adami **Interested Party** • Fred C. Prillaman	First of America Center 1 North Old State Capitol Plaza, Suite 325	Springfield IL 62701-1323	217/528-2517 217/528-2553
Sonnenschein Nath & Rosenthal **Interested Party** • Frank H. Hackmann	One Metropolitan Square Suite 3000	St. Louis MO 63102	314/241-1800
Deutsch, Levy & Engel, Chartered	225 West Washington	Chicago IL 60606	312/346-1460

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO:	)	
TIERED APPROACH TO CORRECTIVE	)	R11-9
ACTION OBJECTIVES	)	(Rulemaking-Land)
(35 Ill. Adm. Code 742)	)	

PRE-FILED TESTIMONY OF TRACEY HURLEY

Qualifications

My name is Tracey Hurley. I am an Environmental Toxicologist with the Toxicity Assessment Unit at the Illinois Environmental Protection Agency ("Illinois EPA"). I have been with the Illinois EPA for twenty-four years. I have been a member of the Illinois EPA's workgroups that developed the original 35 Ill. Adm. Code Part 742 rule, Tiered Approach to Corrective Action Objectives ("TACO", R97-12) and subsequent amendments.

I was a member of the Agency's workgroup that developed the original 35 Ill. Adm. Code Part 620 rule, Groundwater Quality Standards (PCB R89-14).

I have a Bachelor of Science degree in Biology and a Master of Public Health degree.

Testimonial Statement

I will be testifying in support of the proposed amendments to 35 Ill. Adm. Code 742: Tiered Approach to Corrective Action Objectives. I will present an overview of the updates to the tables in Appendices A, B, and C and Errata Sheet 1.

There are four main explanations for the revisions to the tables: 1) changes in the physical and chemical parameters, 2) changes in the toxicity values, 3) addition of

chemicals as a result of their inclusion in the proposed Groundwater Quality Standards (35 Ill. Adm. Code 620, R08-18), and 4) addition of the Indoor Inhalation exposure pathway. Rick Cobb and Tom Hornshaw, Illinois EPA, provided testimony on the addition of chemicals to the proposed Groundwater Quality Standards during the Part 620 hearings (R08-18). (See pages 11 – 17 of Rick Cobb's pre-filed testimony, pages 5 – 7 of Tom Hornshaw's pre-filed testimony, questions and responses numbers 2, 17, and 18 from the supplemental testimony of Richard P. Cobb and Thomas C. Hornshaw.) Gary King, Illinois EPA, will provide more detailed testimony on the Indoor Inhalation exposure pathway. I will first describe the basis of the physical and chemical parameters and toxicity values in more detail before I discuss the changes to the tables.

Physical and Chemical Parameter Values

The Tier 1 Remediation Objectives for the indoor inhalation route have been calculated using updated physical and chemical parameter values and toxicity values for several of the chemicals. The revised physical and chemical parameter values are the result of updates in the sources the Illinois EPA uses for this information. These sources include the following online databases: USEPA's Superfund Chemical Data Matrix, (SCDM), CHEMFATE, PhysProp, USEPA's Water9 software for diffusivity values, and *Handbook of Environmental Degradation Rates* by P.H. Howard (1991) for first order degradation constant values. The SCDM database and Water software were used by USEPA in developing the Soil Screening Levels (SSL). The CHEMFATE and PhysProp databases are the original sources for some of the information in the SCDM database. Howard (1991) also was used by USEPA in developing the Soil Screening Levels.

We have added a footnote to the end of the title of Appendix C, Table E, proposed

footnote "e". Footnote "e" reads: "The values in this table were taken from the following sources (in order of preference): SCDMS online database (http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm); CHEMFATE online database (http://www.srcinc.com/what-we-do/databaseforms.aspx?id=381); PhysProp online database (http://www.srcinc.com/what-we-do/databaseforms.aspx?id=386); Water9 (http://www.epa.gov/ttn/chief/software/water/) for diffusivity values; and *Handbook of Environmental Degradation Rates* by P.H. Howard (1991) for first order degradation constant values."

Toxicity Values

On December 5, 2003, USEPA issued a memorandum (OSWER Directive 9285.7-53) from Michael B. Cook, Director of the Office of Superfund Remediation and Technology Information, to the Superfund National Policy Managers, Regions 1-10, on Human Health Toxicity Values in Superfund Risk Assessments. As a result, several of the toxicity values changed and some new values were added. As discussed by Tom Hornshaw during the Part 620 hearings (R08-18) pages 2 – 4 of his pre-filed testimony, this memo revised the hierarchy for selecting human health toxicity values that had been used since the issuance of the original hierarchy in the 1989 Risk Assessment Guidance for Superfund (RAGS). The RAGS hierarchy, which has also been used by the Toxicity Assessment Unit in developing human health toxicity values, was to first use values from USEPA's Integrated Risk Information System (IRIS) database, if available; otherwise, values from the most recent Health Effects Assessment Summary Tables (HEAST) were to be used. If no toxicity value was available from either of these sources, then values could be derived from literature sources or a request could be made to USEPA's National

Center for Environmental Assessment (NCEA) for provisional toxicity values.

The revised hierarchy still specifies the IRIS database as the first option for toxicity values, but now includes second and third tiers of data sources. The second tier is a recently introduced database, USEPA's Provisional Peer Reviewed Toxicity Values (PPRTVs), available from NCEA. The third tier, Other Toxicity Values, includes three named sources but could also include other sources as appropriate. The three named sources are the Agency for Toxic Substances and Disease Registry's (ATSDR) Minimal Risk Levels (MRLs), developed for ATSDR risk assessments; California EPA's toxicity values, developed to support various rules and programs; and USEPA's HEAST, which was last updated in 1997.

The Toxicity Assessment Unit has adopted this hierarchy, with some minor revisions, as the basis for determining the toxicity values for its activities. As we began using the new hierarchy, we became aware of some minor issues that ultimately lead to certain revisions of the hierarchy. Three issues that resulted in a minor revision are:

- PPRTVs are given an "eligible for update" date by USEPA, leading us to question what should be the role of these PPRTV values after this specified date; we ultimately decided to continue using them instead of going to tier three.
- PPRTVs for some chemicals contain some screening level toxicity values in an appendix. If information is available for a chemical that, although insufficient to support derivation of a provisional toxicity value, may be of limited use to risk assessors, a screening value is developed. These screening values are available in an appendix and receive the same level of internal and external scientific peer review as the PPRTV documents. Therefore, we decided to consider these values

but give them lesser weight than a PPRTV provisional toxicity value by considering them in tier three.

- USEPA's hierarchy does not provide guidance on which value to use if more than one value is available from the three named sources in tier three. We decided to follow the same order from USEPA's Regional Screening Levels website (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm): ATSDR chronic MRL, California EPA chronic toxicity value, chronic toxicity value from a PPRTV appendix, or chronic toxicity value from HEAST.
- IRIS does not contain values for subchronic exposures, only values for chronic exposures, so there is essentially no first tier for shorter-duration exposures; however, some chronic IRIS values use an Uncertainty Factor to extrapolate to chronic exposures from a study of subchronic duration, and we have used the IRIS value with this Uncertainty Factor removed as the first tier when available.

The toxicity parameters, their values, and the sources of these values are listed on the Illinois EPA website. The tables on the website are updated on a quarterly basis. We refer users of TACO to the website to ensure that they have the most current information. Therefore, we are proposing the following changes: For the symbols RfC, RfD_o, SF_o, URF in Appendix C, Table B, the Source column will now read "Illinois EPA (http://www.epa.state.il.us/land/taco/toxicity-values.xls)". The same source is listed for the symbols RfC and URF in Appendix C, Table M.

The OSWER Directive 9285.7-53 has been added to the Incorporations by Reference, Section 742.210. The reference to IRIS has been removed and the OSWER Directive 9285.7-53 added in its place in Sections 742.705(d)(2), 742.710(c)(2),

742.710(c)(3), and 742.715(b)(2).

Appendix A

Table A has an added column for the Soil Saturation Concentration ("C_{sat}") values for the Soil Component of the Groundwater Ingestion Exposure Route. In the process of updating the tables, we realized that each chemical actually has two different C_{sat} values, one for the Outdoor Inhalation Exposure Route and one for the Soil Component of the Groundwater Ingestion Exposure Route. These exposure routes assume different default fraction organic carbon content of soil ("foc") values as listed in Appendix C, Table B. The Soil Component of the Groundwater Ingestion Exposure Route uses an foc value of 0.002 g/g because it is modeling a contaminant that is moving into deeper soils with a lower organic carbon content. The Outdoor Inhalation Exposure Route uses 0.006 g/g because it is modeling a contaminant that is moving through surface soils with a higher organic carbon content. The C_{sat} values listed in Appendix A, Table A of the 2007 version of TACO are actually for the Outdoor Inhalation Exposure Route only. It was an oversight that C_{sat} values for the Soil Component of the Groundwater Ingestion Exposure Route were not included also.

The C_{sat} values listed in Appendix A, Table A have been calculated with the updated Solubility, Organic Carbon Partition Coefficient ("K_{oc}"), and Dimensionless Henry's Law Constant ("H'") properties of the chemicals. The C_{sat} values were calculated using equations S19 and S29 in Appendix C, Table A. The physical and chemical properties used in the equations are listed in Appendix C, Table E. Three footnotes have been added. Footnote "a" specifies that the C_{sat} values were calculated using an foc of 0.006 g/g and a system temperature of 25°C. The values with a "b"

footnote were calculated using an foc of 0.002 and a system temperature of 25°C. Footnote "c" specifies that the C_{sat} was calculated at a pH of 6.8. If a site's soil pH is a value other than 6.8, then a site-specific C_{sat} should be calculated using equations S19 and S29 and the pH-specific K_{oc} values listed in Appendix C, Table I. The K_{oc} values for ionizing organic chemicals will vary with pH. The footnotes are new, but the practices are not.

Tables E and F have been updated with fourteen new chemicals. These are the same chemicals that have been added to the proposed Groundwater Quality Standards (35 Ill. Adm. Code 620, R08-18). The target organs have been updated to reflect new toxicity information. Additionally, the tables have been alphabetized by target organ.

Table J is a new table containing a list of volatile chemicals that must be considered for the indoor inhalation route. "Volatile chemical" is defined in 742.200 as a chemical with an H' value greater than 1.9×10^{-2} or a vapor pressure greater than 0.1 Torr (mm Hg) at 25°C and elemental mercury. USEPA, in its "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils" (November 2002), defines a volatile chemical as having a Henry's Law Constant greater than 10^{-5} atm m^3/mol (equivalent to an H' value of 4.1×10^{-4}). The existing TACO definition for volatile organic compounds is based on SW-846 analytical methods or a boiling point less than 200 °C and a vapor pressure greater than 0.1 Torr (mm Hg) at 25°C. We felt that having two separate definitions for volatile chemicals, one for the indoor inhalation pathway using USEPA's definition and one for the other pathways, would be too confusing. In addition, USEPA's definition includes many polynuclear aromatic hydrocarbons (such as acenaphthene and chrysene) that really do not volatilize

in a significant amount. In order to reconcile the two definitions, we looked at certain physical-chemical properties of the chemicals and whether these properties determined if the chemical was analyzed by an SW-846 method for volatiles or analyzed as a semi-volatile.

The physical-chemical properties we examined included vapor pressure, boiling point, H', molecular weight, and the log of the octanol-water partition coefficient ("logP"). logP is used to calculate K_{oc}. There did not appear to be a relationship between boiling point, molecular weight, and logP to the analytical method for the chemical. It appears that chemicals with a vapor pressure greater than 0.1 Torr (mm Hg) at 25°C are primarily analyzed as volatiles. However, this criterion does not classify naphthalene as a volatile. We wanted to include naphthalene in the definition of a volatile chemical because it can be analyzed either as a volatile chemical (using SW-846 method 8260) or as a semi-volatile (using SW-846 method 8270). Naphthalene generally is considered to exhibit characteristics of both a volatile chemical and a semi-volatile chemical and it does volatilize. Therefore, following USEPA's lead, we decided to include H' in the definition of volatile chemical. We chose a value for H' of 1.9×10^{-2} in order to include naphthalene (H' of 1.98×10^{-2}). Elemental mercury was specifically included in the definition of volatile chemical because it is volatile and has outdoor inhalation remediation objectives already in TACO.

Table K is another new table. It lists the Soil Vapor Saturation Concentration ("C_v^{sat}") values for the volatile chemicals. The C_v^{sat} values have been calculated using equation J&E5 from Appendix C, Table L, the default parameters listed in Appendix C, Table M, and the physical and chemical parameters listed in Appendix C, Table E.

Appendix B

Table G is a new table. In it are listed the Soil Gas Remediation Objectives for the Outdoor Inhalation Exposure Route for Residential, Industrial/Commercial, and Construction Worker receptors for the 59 volatile chemicals. The Remediation Objectives have been calculated using the new equation S30 listed in Appendix C, Table A, the default parameters listed in Appendix C, Table B, and the Tier 1 soil remediation objectives from the 2007 version of TACO (adopted in R06-10). The chemical-specific values for C_v^{sat} are listed in Appendix A, Table K, and physical/chemical parameters are listed in Appendix C, Table E. If the calculated Tier 1 soil gas remediation objective exceeds the C_v^{sat} value of the chemical, the C_v^{sat} value is shown as the remediation objective. Capping the remediation objectives in this way precludes a two-phase system, or free product. The models used in TACO are invalid if there are two phases.

The C_v^{sat} value of the chemical is listed as the remediation objective if there are no inhalation toxicity values for the chemical. Inhalation toxicity values were not available for ten volatile chemicals: acetone, bromodichloromethane, butanol, chlorodibromomethane, 2-chlorophenol, dalapon, cis-1,2-dichloroethylene, hexachloroethane (for residents and industrial/commercial workers), 2-methylnaphthalene, and 1,1,2-trichloroethane. Tier 1 soil gas remediation objectives developed for these chemicals are set at the soil vapor saturation limit calculated using the Tier 1 default values. Illinois EPA decided to use this approach rather than using the oral toxicity values because extrapolating oral toxicity values is not appropriate. The chlorinated solvents are metabolized in the liver when they are ingested but not when they are inhaled. This means that the amount of chemical or form or both and,

ultimately, the toxicity, of the chemical that is circulating in the body is going to be different for inhalation and ingestion exposures. By not substituting oral toxicity values for missing inhalation toxicity values Illinois EPA is consistent with USEPA's *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) Final,* as incorporated by reference in Section 742.210.

Tables H and I are both new tables. They list the soil gas and groundwater remediation objectives for the indoor inhalation exposure route for residential and industrial/commercial receptors. The remediation objectives in Table H are calculated using both diffusive and advective transport mechanisms while Table I remediation objectives are calculated using diffusion only as the transport mechanism through soil. Both Table H and Table I remediation objectives were calculated using toxicity values from the hierarchy discussed earlier, physical/chemical values listed in Appendix C, Table E, the J&E equations listed in Appendix C, Table L, and the default parameter values listed in Appendix C, Table M. As in Table G, if the calculated Tier 1 soil gas remediation objective exceeds the C_v^{sat} value of the chemical or if there are no inhalation toxicity values, the C_v^{sat} value is shown as the remediation objective. Similarly, if the calculated groundwater remediation objective exceeds the solubility of the chemical in water (listed in Appendix C, Table E) or there are no oral toxicity values available, the solubility limit becomes the remediation objective. The chloroform groundwater remediation objective for residential receptors is the Groundwater Quality Standard listed in 35 Ill. Adm. Code 620, Section 620.410 (R08-18). The calculated remediation objective for chloroform was lower than its Groundwater Quality Standard. Illinois EPA

made a decision that groundwater remediation objectives for the indoor inhalation route of exposure should not be lower than the Groundwater Quality Standards or the groundwater remediation objectives for the groundwater ingestion exposure route. We feel that standards or objectives based on protecting people who may directly ingest the chemical in drinking water should be sufficiently protective of people who may be exposed through the indoor inhalation route.

Appendix C

Table A has a new equation, S30. This equation is used to calculate the soil gas remediation objectives for the outdoor inhalation exposure route listed in Appendix B, Table G. Equation S30 uses the soil remediation objectives for the outdoor inhalation route of exposure and converts them to soil gas remediation objectives using an equilibrium conversion which assumes that the soil gas is in three phase equilibrium with the contaminated soil at the source. This calculation takes into account soil-specific properties – water-filled soil porosity, the soil-water partition coefficient, the air-filled soil porosity, and the dry soil bulk density – and uses a chemical-specific Dimensionless Henry's Law Constant set at a system temperature of 13°C (as in Tier 1 indoor inhalation exposure route).

In Table B the source of the toxicity values has been changed from IEPA (IRIS/HEAST) to Illinois EPA: http://www.epa.state.il.us/land/taco/toxicity-values.xls. As discussed previously in my testimony, USEPA's latest hierarchy (OSWER Directive 9285.7-53, December 5, 2003) for Human Health Toxicity Values no longer lists only IRIS and HEAST. There are three tiers of available sources. To simplify the source, we have just listed Illinois EPA's TACO website.

Table E lists updated Default Physical and Chemical Parameters. The 14 new chemicals from the proposed Groundwater Quality Standards (R08-18) have been added. All values are now expressed in scientific notation for ease of readability. The sources for the physical and chemical parameter values include the online databases: USEPA's Superfund Chemical Data Matrix System, CHEMFATE, PhysProp, USEPA's Water9 software for diffusivity values, and *Handbook of Environmental Degradation Rates* by P.H. Howard (1991) for first order degradation constant values. These sources are listed in new footnote "e".

Table F has been updated to include the J&E equations to the "Method" column for the parameters of total soil porosity, air-filled soil porosity, and water-filled soil porosity.

Table L is a new table that includes all of the equations required for the J&E model. Gary King, Illinois EPA, will provide testimony on the modified J&E equations.

Table M includes the parameters and default values used in the J&E equations. Gary King also will provide a more in depth discussion of these.

The equations from Table L and the parameters and default values in Table M were used to generate the Tier 1 Indoor Inhalation Remediation Objectives listed in Appendix B, Tables H and I.

Errata Sheet Number 1

This part of my testimony concerns the changes made in Errata Sheet Number 1, which is being filed concurrently with Illinois EPA's pre-filed testimony.

Two additional documents are being added to the list of Incorporations by Reference in Section 742.210. The first document is "API. American Petroleum Institute,

1220 L Street, NW, Washington, DC 20005-4070 (202) 682-8000. 'BIOVAPOR – A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0 (January 2010).'" The Biovapor model is a method that can be used to demonstrate biodegradation under Section 742.312(b)(1)(C). The second document is "Illinois Environmental Protection Agency, 1021 N Grand Ave East, Springfield, IL 62702 (217) 785-0830. 'A Summary of Selected Background Conditions for Inorganics in Soil,' Publication No. IEPA/ENV/94-161, August 1994." This document is the basis for the concentrations of inorganic chemicals in background soils listed in Appendix A, Table G.

Also in Section 742.210, the reference to "Risk Assessment Guidance for Superfund, Volume I; Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk Assessment Interim Guidance", Draft (August 18, 1992)" should be deleted. The final version of this guidance has been proposed for addition to the Incorporations by Reference.

The reference to a previous subsection in Section 742.505(c)(4) should read "If the conditions of subsection (c)(3) of this Section are not met, the Class I groundwater remediation objectives set forth in Appendix B, Table E shall be corrected for the cumulative effect of mixtures of similar-acting chemicals using the following methodologies." The subsection lettering was changed but the corresponding change to the reference was not made.

In Appendix B, Tables G, H, and I, the CAS No. for 1,2-Dichloropropane should be changed to78-87-5. It is incorrectly listed as 78-97-5.

In Appendix C, Table E, the footnote for PCBs for the Dimensionless Henry's Law Constant (H') at 13°C indicates that PCBs are not volatile. Some PCBs do meet the

definition of volatile chemical in Section 742.200. Therefore, we are changing the footnote from "b" to "a". In footnote "a", we are changing the reference to Tier 2 so that it includes Tier 3, correcting the incorporation by reference, and adding a sentence to the end. Footnote "a" should now read "Soil remediation objectives are determined pursuant to 40 CFR 761, as incorporated by reference at Section 742.210(b) (the USEPA "PCB Spill Cleanup Policy"), for most sites; persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired. PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical parameters depend on the congeners present at the site."

While the requirements of 40 CFR 761 apply to soil remediation objectives, they do not apply to soil gas or groundwater remediation objectives. Calculation of a single soil gas or groundwater remediation objective for the indoor inhalation exposure route for PCBs is complicated by the fact that PCBs are a mixture of different congeners, the congeners have different physical/chemical parameter values and toxicity values, and only some of the congeners are volatile. Therefore, Illinois EPA is replacing footnote "d" in Appendix B, Tables G and H and footnote "e" in Appendix B, Table I to read "PCBs are a mixture of different congeners. The appropriate values to use for the physical/chemical and toxicity parameters depend on the congeners present at the site. Persons remediating sites should consult with BOL if calculation of Tier 2 or 3 remediation objectives is desired."

In Appendix C, Table M, the parameter value for Theta A (θ_a) should be 0.28 cm^3/cm^3, not 0.13 cm^3/cm^3. When Illinois EPA changed the Theta W (θ_w) to 15 percent, a corresponding change should have been made to θ_a so that θ_a and θ_w values added

together equal the total soil porosity value (Theta T, θ_T). The correct value for θ_a of 0.28 cm^3/cm^3 was used in calculating the remediation objectives.

This concludes my testimony.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
PROPOSED AMENDMENTS TO	)	
TIERED APPROACH TO CORRECTIVE	)	R11-9
ACTION OBJECTIVES	)	(Rulemaking-Land)
(35 Ill. Adm. Code 742)		

PRE-FILED TESTIMONY OF GARY KING

Qualifications

My name is Gary King. I am the Manager of the Division of Remediation Management for the Bureau of Land at the Illinois Environmental Protection Agency. Since 1990, I have been senior manager for the Illinois EPA site cleanup programs: the voluntary cleanup program, federal and state Superfund cleanup programs, Department of Defense cleanup program, Brownfields assistance program and the Leaking Underground Storage Tank program. I led Illinois EPA's development of the original 35 Ill. Adm. Code Part 742 rule, Tiered Approach to Corrective Action Objectives (TACO, R97-12) and all subsequent amendments.

I also chaired the Association of State and Territorial Solid Waste Management Officials ("ASTSWMO") CERCLA Research Center from January 2001 to October 2008. In that role I had frequent contact with other States and U.S. EPA concerning important issues to State and federal Superfund programs.

Prior to 1990, I managed Illinois EPA land enforcement programs. I am an attorney and hold a B.S degree in civil engineering from Valparaiso University.

Testimonial Statement

I will be testifying in support of the proposed amendments to 35 Ill. Adm. Code 742: Tiered Approach to Corrective Action Objectives. I will present an overview of the pathway

evaluation and tiered approach to the indoor inhalation exposure route; describe the derivation of the Tier 1 remediation objectives for the indoor inhalation exposure route, including the recommended parameter values for the modified Johnson and Ettinger (J&E) model; and explain the rationale and requirements for the use of soil gas data and building control technologies.

Subpart A: Introduction

Section 742.115 introduces the exposure routes to be evaluated under this Part, including the indoor inhalation exposure route. The indoor inhalation route has two components: a soil gas component and a groundwater component. The soil gas component is the migration of contaminants from soil through soil gas into a building interior. The groundwater component is the migration of contaminants from groundwater through soil gas into a building interior. This pathway is unique in that it involves three types of media: soil, groundwater, and soil gas.

Although the indoor inhalation route involves three media (soil, soil gas and groundwater), the Agency proposal only develops remediation objectives for two of those media: soil gas and groundwater. Unlike the August 2008 proposal (R09-9), the current November 2010 proposal does not develop remediation objectives for soil per se. Soil, like groundwater, can be a source for volatile chemicals to release into soil gas; however, the Agency's review of scientific literature during the intervening period between proposals has revealed considerable skepticism as to whether risks to human health through the indoor inhalation route can be meaningfully determined based on concentrations of volatile chemicals in soils. On the other hand, the scientific literature continues to confirm that indoor inhalation risks can be meaningfully developed based on levels of volatile chemicals in soil gas and in groundwater. As such, the current Agency proposal does not provide soil remediation objectives under Tier 1 or 2, although a site specific proposal could be developed under Tier 3 (Section 742.935(d)).

Section 742.115 also introduces the concept of using soil gas measurements to determine outdoor inhalation risks. Sites that determine soil gas levels for compliance purposes for the indoor inhalation route may also be able to use that data to determine if an outdoor inhalation risk exists. As a result the Agency is proposing a new table in Appendix B, Table G that provides Tier 1 objectives for soil gas for the outdoor inhalation route. For the outdoor inhalation route, the Agency has not proposed deletion of the soil remediation objectives in Appendix B, Tables A and B. The outdoor inhalation route and the indoor inhalation route use two different models. The outdoor route uses the SSL model; this model has been in place for the outdoor route since TACO became effective in 1997. The indoor route uses a modified J&E model. These models use different input elements. For example, the SSL model uses a fraction of organic carbon (foc) value of .006 based on shallow, surficial soils while the modified J&E model uses a foc of .002 based on deeper subsurface soils.

The November 2010 proposal also amends Subpart A by adding a new subsection (i) to Section 742.105. This change makes it clear that the proposed indoor inhalation rules are evaluating whether chemical contamination outside a building may cause a human health risk within a building. The proposal does not address whether contamination within the building, either in the building structure itself or in products within the building, may be creating human health risks.

Subpart B: General

The August 2008 version of Section 742.200 contained new definitions for the terms "building," "building control technology," "soil gas," and "soil vapor saturation limit." The November 2010 version still proposes to use these definitions and adds definitions for "capillary fringe", "saturated zone", "water table" and "Qsoil". These terms appeared in 2008 proposal, but

were undefined. The Agency believes that inclusion of these definitions gives greater clarity to the current proposal. The Agency has made a minor change to the definition of "building control technology". The use of "building control technology" describes mitigation systems for indoor inhalation risks and is compatible with the existing term "engineered barriers." The change makes a minor edit deleting a reference to "geologic materials" and making the revised definition consistent with the building control technologies identified in Subpart L. The current proposal continues with the definition of "volatile chemicals" proposed in 2008. The definition resulted from a re-examination (and eventual deletion) of the original definitions of "volatile organic compounds" and "volatile chemicals." The term is used to define contaminants subject to evaluation under the indoor inhalation exposure route, including elemental mercury.

Section 742.210 contains 22 new incorporations by reference. The vast majority of these 22 also appeared in the 2008 proposal. The most notable of these are U.S. EPA's draft guidance, *Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*, which established the use of the J&E model, and its companion document, *Users Guide for Evaluating Subsurface Vapor Intrusion into Buildings*, which provided justification for certain parameter values. Other significant publications include ASTM International's *Standard Practice for Assessment for Vapor Intrusion into Structures on Property Involved in Real Estate Transactions* and the Interstate Technology and Regulatory Council (ITRC)'s *Vapor Intrusion Pathway: A Practical Guide*. Additional incorporations have been included to provide soil gas analytical methods, source information for parameter value selection, and techniques for mitigation systems.

Section 742.222 provides methods for determining the soil vapor saturation limit and parallels Section 742.220, which is used for determining the soil saturation limit. The soil vapor

saturation limit is the maximum vapor concentration that can exist in the soil pore air at a given temperature and pressure. Section 742.Appendix A, Table K presents the soil vapor saturation limits for volatile chemicals. For the indoor inhalation exposure route, soil gas remediation objectives cannot exceed the soil vapor saturation limit; otherwise, the assumptions of the modified J&E model would be violated. The modified J&E model as well as the existing RBCA and SSL models operate on similar assumptions regarding soil saturation and solubility. These risk-based models assume an equilibrium between contaminant concentrations that exist as vapors in soil pores, contaminants that adhere to soil particles, and contaminants that dissolve into water within soil pores.

The Agency has modified existing Section 742.225 to clarify that it applies to soil and groundwater remediation objectives.

New Section 742.227 provides minimum requirements for the collection and analysis of soil gas samples for both the indoor and outdoor inhalation routes. Ordinarily, sampling locations, quantities and protocol are determined by the program under which the remediation is being performed (LUST, RCRA, Site Remediation Program); however, because the use of soil gas data is not as well understood by site evaluators, Illinois EPA decided to specify the most essential criteria to reduce the likelihood of error, the misrepresentation of actual conditions, and the need for repeat sampling. The November 2010 proposal specifies that a helium tracer or other leak apparatus detection system, approved by the Agency, is to be used. Scientific literature since 2008 favors the use of helium as a tracer.

Subpart C: Exposure Route Evaluations

Section 742.312 identifies ways in which the indoor inhalation exposure route may be excluded from consideration. Indoor inhalation presents a risk only if volatile chemicals are the

contaminants of concern. If a site has none of the 59 chemicals listed in Section 742.Appendix A, Table J or any other contaminants meeting the new definition of "volatile chemicals," then the indoor inhalation pathway does not need to be evaluated.

If volatile chemicals are present, the site evaluator has the option of excluding the pathway by either restricting buildings above contaminated areas or by implementing building control technologies. The general pathway exclusion criteria of existing Sections 742.300 and 742.305 must also be met; these are the "speed bumps" to prevent free product, the leaving behind of materials with the potential impact of hazardous waste, and concentrations of polychlorinated biphenyls above 50 parts per million. The November 2010 proposal adds to Section 742.305 a new "speed bump" provision for soil gas. Subsection (g) specifies that an exposure route cannot be excluded if the soil gas exceeds 10 percent of the Lower Explosive Limit.

The proposed building-specific exclusions would need institutional controls as follows:

1. A land use restriction prohibiting a building or man-made pathway above the contaminated soil gas or groundwater. (The indoor inhalation exposure route is incomplete if a building does not exist.)
2. Operation and maintenance requirements for approved building control technologies, including sub-slab depressurization, sub-membrane depressurization, membrane barriers or vented raised floors. These requirements are contained in the new Subpart L: Building Control Technologies.

The indoor inhalation exposure route cannot be excluded by use of a groundwater ordinance. This exclusion is not allowed because an ordinance restricting the use of groundwater

as a source of drinking water would not protect the enclosed air space of a building from the migration of contaminants emanating from the groundwater.

Section 742.310 applies to outdoor inhalation; Section 742.312 applies to indoor inhalation. In both sections the Agency has included provisions that allow for pathway exclusion for the petroleum constituents benzene, toluene, ethylbenzene and total xylenes (BTEX) based on a demonstration of active bio-degradation. Although technically a bio-degradation proposal could be submitted under Tier 3, without regard to changes in Subtitle C, the Agency believes that a specific recognition as to the progress made in identifying active biodegradation of the BETX components of petroleum as part of the inhalation pathway is appropriate and will significantly assist in addressing this pathway. It is important to note that the biodegradation research for petroleum constituents and this pathway do not apply to other volatile chemicals.

Sections 35 Ill. Adm. Code 742.310(a)(2) and 742.312(b)(1)(C) have been drafted broadly enough to accommodate different models as they emerge in the future. One model that is gaining acceptance for use in demonstrating active biodegradation of petroleum constituents (including BTEX) is BioVapor – A 1-D Vapor Intrusion Model with Oxygen-Limited Aerobic Biodegradation, Version 2.0, American Petroleum Institute, 2009. This model is publicly available at www.api.org. The testimony that follows is not intended to be an endorsement, or even an approval of this model for use at Illinois sites, but is intended to summarize how it functions.

BioVapor uses a spreadsheet function to perform calculations that allow prediction of indoor air concentrations and associated risks from contaminants in soil gas or groundwater. It also calculates backwards to determine acceptable soil gas and groundwater concentrations from indoor-air screening levels. The model applies bioattenuation only when sufficient oxygen is

present in the vadose zone (i.e., aerobic bioattenuation). It uses a mass-balance approach to ensure that the amount of bioattenuation does not exceed the amount of available oxygen (LUSTLine Bulletin 66, December 2010, p.19). In general uncontaminated soils have higher oxygen levels than contaminated soils, thus allowing bioattenuation to occur. The Utah Department of Environmental Quality, Leaking Underground Storage Tank Section has done considerable work in demonstrating the capacity of uncontaminated soils to bioattenuate BTEX levels moving upward through the vadose zone. That work was recently reported at www.newipcc.org/lustline/supplements.asp.

Input parameters for BioVapor include environmental factors, the chemicals to be evaluated, and the chemical concentrations. Use of BioVapor, or any other model, at Illinois sites will have to be consistent with the default parameters in 35 Ill. Adm. Code 742, Appendix C, Table B or Table M for the outdoor or indoor inhalation exposure route, respectively. If there is a conflict, the default parameters in Appendix C, Table B or Table M will have to be used.

Following a successful demonstration of active biodegradation, a clean soil layer above the contamination will need to be maintained to allow biodegradation to occur and to prevent BTEX migration into a structure. This requirement would be incorporated into an institutional control as provided under Section 742.1000(a)(6).

Subpart E: Tier 1 Evaluation

A Tier 1 remediation objective is a numerical chemical concentration that represents a level of contamination at or below which there are no human health concerns. Sites achieving residential Tier 1 remediation objectives are intended to clearly indicate that the property meets an unrestricted land use category for that category of use. Tier 1 requires a determination of either residential or industrial/commercial land use. Generally, equally protective but less

restrictive remediation objectives apply to the industrial/commercial sites. [Note: whenever remediation objectives are based on an industrial/commercial land use, an institutional control must be placed on the property in accordance with Section 742.1000(a)(1).]

As with the other exposure routes, the indoor inhalation remediation objectives are calculated based on a one-in-a-million individual excess cancer risk for chemicals causing carcinogenic adverse health effects and a hazard quotient of one for chemicals causing noncarcinogenic adverse health effects.

Risk-based indoor inhalation remediation objectives were derived from equations combining exposure assumptions with toxicity data. The steps used to develop the soil gas and groundwater remediation objectives included:

1. Calculating a concentration of the contaminant of concern in indoor air that adequately protects humans who inhale this air (i.e., meets the above mentioned risk criteria);
2. Calculating an acceptable concentration of the contaminant of concern in the soil gas at the source of contamination. This concentration will not cause the contaminant in indoor air to exceed the concentration calculated in Step 1. This calculation was made using an attenuation factor derived from a mathematical model developed by Johnson and Ettinger (J&E). [Note: the ratio of the concentration in the indoor air (Step 1) to the soil gas concentration is called the attenuation factor. Thus the primary use of the J&E model is to calculate the attenuation factor.]

3. Calculating acceptable groundwater remediation objectives using the soil gas remediation objective calculated in Step 2, with the assumption that this contaminant is in three phase equilibrium.

The J&E model is the most common predictive model used by State environmental agencies in calculating the attenuation of contaminant concentrations from the subsurface to indoor air. The attenuation factor accounts for the following processes:

1. Migration of contaminants from the source upwards through the vadose zone. The source of contaminant concentrations in the subsurface may be either soil or groundwater. If the source is groundwater, the attenuation factor considers the initial migration of contaminants through the capillary fringe.
2. Migration of contaminants through the dirt filled cracks in the slab-on-grade or basement floor.
3. Mixing of the contaminants with air inside the building.

Illinois EPA provides 18 J&E equations and 54 default parameter values (Section 742.Appendix C, Tables L and M). Exposure factors are consistent with the values used in the current TACO regulations. Toxicity factors were obtained using U.S. EPA's hierarchy and are chemical-specific. Existing Sections 742.505(b)(3) and (4), which contain the procedures for addressing the additive effects of similar-acting chemicals in developing Tier 1 groundwater remediation objectives, also apply to the indoor inhalation exposure route.

Tier 1 remediation objectives have been developed for a slab-on-grade building. A slab-on-grade building is a more conservative scenario because there is less air available in the building to mix with the contamination. A building with a basement assumes there is mixing of the air between the basement and the first floor. Tier 1 remediation objectives are applicable to

both slab-on-grade buildings and buildings with basements.

A slab-on-grade building is one with a concrete floor at about the same level as the grade of the surrounding area; a basement would typically be below the grade of the surrounding area. Tier 1 indoor inhalation remediation objectives calculated for a slab-on-grade building are not much lower than what would be developed for a similar building with a basement.

Building-specific default values for the following parameters were used to develop the Tier 1 remediation objectives: length of building (L_B), width of building (W_B), height of building (H_B), surface area of enclosed space at or below grade (A_B), and building ventilation rate (Q_{bldg}). The same default values must be used for the same parameters when performing Tier 2 calculations. The actual values of these parameters do not have a great impact on the remediation objective; however, the default values are based on a conservative representation of the type of buildings that are or may be present at the site in the future. Without these conservative values, restrictions would be required on the minimum size of a building that can be constructed over the contaminated area.

For the indoor inhalation exposure route, the industrial/commercial remediation objective differs from the residential remediation objective in three ways: exposure duration, building size, and air exchange rate. The air exchange rate (ER) is used to represent the mixing that occurs within a building. The air within a residence is assumed to be flushed out of the building at a rate of 13.8 times per day (0.53 times per hour) and at a commercial location at the rate of 22.32 times per day (0.93 times per hour) based on values listed by Hers et al. (2001) and Murray and Burmaster (1995). These two papers are the source of the recommendations in U.S. EPA's *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* (2004).

For the J&E equations, Illinois EPA used a chemical-specific value for

Dimensionless Henry's Law Constant set to a default system temperature of 13°C. U.S. EPA's draft vapor intrusion guidance – as well as the other exposure routes in TACO – set the system temperature for Dimensionless Henry's Law Constant at 25°C. Illinois EPA decided to use a lower system temperature for the indoor inhalation route in Tiers 1 and 2 because it is more representative of the groundwater temperature in Illinois. The groundwater temperature in Illinois ranges from 8.3° C to 16.7° C; the average within that range is 13.19° C. The lower temperature reduces the Dimensionless Henry's Law Constant, resulting in a less stringent remediation objective. The States of New Jersey and Michigan also apply a state-specific system temperature (13° C and 12.5° C, respectively) for Dimensionless Henry's Law Constant under the indoor inhalation exposure route.

Section 742.Appendix B, Table G provides a Tier 1 table of numerical soil gas values for residential, industrial/commercial and construction worker receptors for the outdoor inhalation route. Section 742.Appendix B, Tables H and I provide a Tier 1 table of numerical soil gas and groundwater values for both residential and industrial/commercial receptors for the indoor inhalation route. Remediation objectives are not provided in Tables H and I for the construction worker population since this receptor group is not at risk from indoor inhalation exposure. The exposure duration for indoor construction in almost all cases is less than the exposure duration for the residents or commercial workers. Thus the protection of these two receptors will ensure protection of the construction worker during the period of indoor construction.

The November 2010 proposal makes a significant change to the Tier 1 portion of the indoor inhalation proposal with regards to the principles of advection. The August 2008 proposal did not include an advection component. U.S. EPA's concerns with Illinois EPA's 2008 proposal centered around the lack of an advection component.

In response, Illinois EPA added the advection component to the modified J&E model it uses to calculate remediation objectives for the proposed indoor inhalation exposure route. The advection component accounts for the migration of contaminants in soil gas brought about by differences in pressure gradients between the interior of a building and the soil nearest the building foundation. Illinois EPA set the parameter value used to measure advective flow, called Q_{soil}, to the U.S. EPA default number.

On May 25, 2010, Illinois EPA met with representatives from U.S. EPA Region 5 to brief them on the revisions Illinois EPA had made to the vapor intrusion proposal in response to their original comments; to answer questions and provide further explanations as needed; and, to request additional review by U.S. EPA Region 5 to obtain their concurrence with the modifications. On August 12, 2010, Illinois EPA received a letter from U.S. EPA Region 5 commenting on and recommending changes to the revised proposal.

U.S. EPA Region 5 recommended that when the Diffusion Only Table (Appendix B, Table I) is used to demonstrate compliance that compliance with both soil gas remediation objectives and groundwater remediation objectives be required. Illinois EPA agreed that multiple lines of evidence from soil gas and groundwater should be obtained prior to using Appendix B, Table I.

In addition, U.S. EPA Region 5 raised concerns about the use of a water filled soil porosity value of 30 percent as being non-representative of Illinois soil conditions. The 30 percent value is the subsurface default parameter value recommended by U. S. EPA's Soil Screening Guidance Document (1996); however, the Site Remediation Advisory Committee (SRAC) raised the same concern when meeting with Illinois EPA to discuss the changes. As a result, in the November 2010 proposal Illinois EPA adjusted the water filled soil porosity value

to 15 percent, a value more consistent with typical Illinois soils. Changing this input parameter, however, meant recalculating the remediation objectives in Appendix B, Tables H and I, lowering them (making them more conservative) by as much as 25 percent in Table H (Diffusion and Advection) and by as much as 90 percent in Table I (Diffusion Only). By using the more conservative water filled soil porosity value of 15 percent typical of Illinois soils, Illinois EPA has developed a more conservative set of screening values and no longer needs to condition use of the Tier 1 Tables based on determining site specific water filled soil porosity (as proposed in the May 2010 draft provided to U.S. EPA and SRAC).

In addition to describing Section 742.Appendix B, Tables H and I, Section 742.515 explains how these Tables are to be used. Table H is used when soil or groundwater contamination is within 5 feet of an existing or potential building or manmade pathway. Table I is used when the distance is more than 5 feet. The Table H values are more conservative than the Table I values because the Table H values reflect forces of both diffusion and advection moving contamination to the interior of a structure. Table I values are based on diffusion only. The extent of the difference in values between the Tables is contaminant specific. For some of the contaminants the difference is a few multiples; for others, it can be an order of magnitude. If Table H values are used, then compliance with Tier 1 values can be based on meeting either the soil gas remediation objectives or the groundwater remediation objectives. If Table I is used, then the Tier I values must be met for both soil gas and groundwater.

When Table I is used, it will be necessary to condition use of the site in the NFR determination such that no future buildings or manmade pathways can be located within 5 feet of the contamination. (See Section 742.1000(a)(7)) If Table H values are complied with, then that conditioning of site use is not required.

The use of indoor air data as a general method to demonstrate compliance with remediation objectives under Tier 1 or 2 was rejected early by Illinois EPA. The Agency continues that approach with the November 2010 proposal. Indoor air samples are highly susceptible to bias from occupant sources (smoking, dry cleaning, household chemical use and storage, etc.). They are also invasive, requiring site evaluators to obtain access to indoor space. The rules do not prohibit the use of indoor air data; however, any such request would be a Tier 3 evaluation. (See Section 742.935(a))

Subpart G: Tier 2 Soil Evaluation

Tier 2 remediation objectives are developed using the J&E equations provided in Section 742.Appendix C, Table L.

Tier 2 calculations require information on the physical and chemical properties of the individual contaminants at a site. As in Tier 1, a chemical's toxicological parameters, physical parameters (obtained from Section 742.Appendix C, Table E), and the J&E equations themselves may not be varied. This is also true for Tier 2 evaluations applying the SSL and RBCA models for the other exposure routes.

Section 742.Appendix C, Table M contains all of the parameters used for the J&E equations. These parameters use either default values (i.e., standardized and/or health protective values) or actual site-specific field data. Where default values are provided, they may be used in Tier 2 equations. That is, only partial site-specific information need be obtained and default values may be used for the rest of an equation's parameter inputs. This practice is consistent with Tier 2 evaluations for the other exposure routes.

Under Tier 2, the attenuation factor is based on site-specific soil properties, including: depth to contaminated soil; types of soil present beneath the ground surface and the

contamination source; and geotechnical parameters (dry soil bulk density, soil total porosity, water-filled soil porosity, and fraction organic carbon content).

Under existing Section 742.610, which will also apply to the indoor inhalation route, to determine site-specific physical soil parameters, a minimum of one boring per 0.5 acre of contamination must be collected. Each soil sample analyzed for one or more of the applicable contaminants of concern must also be analyzed for water content; at sites where multiple samples from multiple depths are analyzed for contaminants on a dry weight basis and their volumetric water content can be measured based on available data, additional samples solely for analysis of water content may not be necessary.

Samples for geotechnical data are not required from directly under the building. Samples collected adjacent to a building are acceptable. In lieu of sampling the different soil types for geotechnical parameters, use of the default soil parameters provided in TACO is also acceptable. Soil parameters obtained from other literature searches and not from site-specific determinations may be allowed under Tier 3.

The depth to contaminated media (D_{source}) is the shortest distance from the base of any existing or potential building (or man-made pathway into the building) to a location where a sample result exceeds the Tier 1 value for a contaminant of concern for the indoor inhalation exposure route.

It is essential to determine the type of soil between the ground surface and the contamination source, as the contaminants must migrate through this soil before entering a building. If the site stratigraphy varies in this zone, it should be divided into different layers. For each different soil layer, the soil type, thickness, water-filled soil porosity and soil total porosity are necessary to calculate the Tier 2 remediation objectives. Specifically, the water-filled soil

porosity and soil total porosity are used to estimate the effective diffusion coefficient for each layer. If the contaminated medium is groundwater, then the capillary fringe is included as one of the soil layers.

The geotechnical parameters – dry soil bulk density, soil total porosity, water-filled soil porosity, and fraction organic carbon content – are used to estimate soil gas concentrations at the source, assuming that the risk being calculated is based on representative soil concentrations. Methods for determining soil parameters for the indoor inhalation exposure route are provided in Section 742.Appendix C, Table F.

The most sensitive parameters are water content and thickness of the capillary fringe. Fraction of organic carbon content (f_{oc}) is also sensitive; increasing f_{oc} increases the remediation objectives. Depth to soil source is not sensitive because the modified J&E model assumes an infinite source with no biodegradation as the vapors migrate through the vadose zone.

Section 742.717 explains how the J&E equations are to be applied when calculating soil gas remediation objectives for the indoor inhalation exposure route. Equations J&E1 through J&E3 are used to calculate the acceptable concentration of the contaminant in indoor air. Equation J&E1 applies only to chemicals that cause carcinogenic health effects, J&E2 applies only to chemicals that cause noncarcinogenic health effects, and J&E3 is used by both types of contaminants to convert from parts per million volume to milligrams per cubic meter. Estimation of indoor air remediation objectives using J&E1 or J&E2 requires two categories of input parameters: toxicological information and receptor-specific exposure factors (exposure frequency, exposure duration and averaging time).

Equation J&E4 calculates a soil gas remediation objective using the appropriate indoor air remediation objective (from either J&E1 or J&E2) and an attenuation factor developed from

Equations J&E7 through J&E18. The soil gas remediation objective must be compared to the saturated vapor concentration (C_v^{sat}). Section 742.222 presents the methods by which the C_v^{sat} concentration is obtained; for example, site evaluators may use the list of C_v^{sat} values in Section 742.Appendix A, Table K or calculate a site-specific C_v^{sat} using equation J&E5. If the calculated soil gas remediation objective is greater than C_v^{sat}, then C_v^{sat} is used as the soil gas remediation objective.

When comparing the calculated soil gas remediation objective to soil gas samples from the site, Section 742.717(j) instructs site evaluators to use soil gas data collected at a depth at least three feet below the ground surface and above the saturated zone. This is to ensure the quality of the soil gas sample. Samples taken less than three feet from the ground surface can be compromised by the influence of barometric pressure fluctuations that may cause an influx of ambient air into the soil, variations in ambient temperature, and precipitation. Samples taken from the capillary fringe or below are unacceptable because of high water saturation.

The C_{sat} table in Section 742.Appendix A, Table A now has two exposure route specific columns because it uses different values for fraction organic carbon content (f_{oc}). The migration to groundwater pathway uses a f_{oc} 0.002 (mg/mg) because the contamination is moving into deeper soils with a lower organic carbon content. The outdoor inhalation exposure route uses a f_{oc} value of 0.006 because the contamination is moving up through the soils. Illinois EPA decided to use a f_{oc} value of 0.002 for the indoor inhalation exposure route because basements are below surface; using a lower f_{oc} value results in a more conservative remediation objective.

Equation J&E7 or 8 may be used to calculate the attenuation factor. This is the heart of the predictive model, measuring how much contamination from the subsurface is expected to reach the indoor air. The source of the contaminant concentrations in the subsurface may be

either soil, groundwater or soil gas. J&E8 assumes that there is no significant pressure difference between the subsurface soil and the building. This means that contaminants emanating from the source do not migrate into the building by advection. Migration by advection is represented by the parameter Q_{soil}, also known as the volumetric flow rate of soil gas into the enclosed space. When Q_{soil} is assumed to equal zero – as is the case with Appendix B, Table I – diffusion is the only contaminant transport mechanism. If advection and diffusion are the modes of contaminant transport, site evaluators would use equation J&E7 to calculate the attenuation factor.

The remaining equations, J&E9a through J&E18, are used to establish the input parameters for application in J&E7 and 8. Equation J&E9a calculates the total overall chemical-specific effective diffusion coefficient. For this equation, each layer of soil (sand, loamy sand, loam etc.) through which contaminant vapors migrate from source to building must be accounted for. The total thickness of the soil layers must equal the distance from the bottom of the slab to the top of the contamination; this relationship is presented in equation J&E9b. The distance, called the source to building separation distance, is calculated by equation J&E10.

Equation J&E11 calculates the chemical-specific effective diffusion coefficient for each soil layer and is used in equation J&E9a. Equations J&E12a and 12b are used to calculate the surface area of the enclosed space at or below grade through which vapors enter into the building. For slab-on-grade buildings, site evaluators must use J&E12a. For buildings with basements, site evaluators must use J&E12b. Equation J&E13 calculates the building ventilation rate using the air exchange rate and the size of the building. For equations J&E12a, J&E12b and J&E13, site evaluators must use the same default values as in Tier 1.

Equation J&E14 calculates the area of total cracks assumed to exist in the portion of the structure below grade through which contaminants migrate into the building; default values from

Tier 1 must be used here as well. Contaminants intrude into the building only through cracks that completely penetrate the slab; these cracks are assumed to be filled with dirt. The thickness of these cracks is represented by the slab thickness, which is set at 10 cm for both Tier 1 and Tier 2. Equation J&E15 calculates the effective diffusion coefficient through the cracks using soil parameters representative of the soil within the cracks; as these parameters cannot be measured directly, the default values in Tier 1 apply.

Equations J&E16 through J&E18 calculate site-specific geotechnical parameters. J&E16 gives the total porosity, which is the ratio of the volume of voids to the volume of soil sample. J&E17 gives the water-filled soil porosity, which is the ratio of the volume of water to the volume of soil. J&E18 gives the air-filled soil porosity, which is a measure of the total porosity minus the water-filled porosity. Porosity values representative of the soil layer at the source of contamination as well as each soil layer through which contaminants migrate are needed to calculate the effective diffusion coefficient (J&E11). Additional methods for determining the physical soil parameters are presented in Section 742.Appendix C, Table F.

It is possible to calculate a Tier 2 soil remediation objective more stringent than the Tier 1 soil remediation objective for the indoor inhalation pathway; in such cases, the Tier 1 remediation objective applies. This practice is consistent with the other exposure routes in TACO.

Subpart H: Tier 2 Groundwater Evaluation

Section 742.805(e) requires site evaluators to follow Section 742.812 in calculating groundwater remediation objectives for the indoor inhalation exposure route.

Under Section 742.812, site evaluators follow the J&E equations presented in Section 742.717, only equation J&E6 is used instead of equation J&E4, and when determining the

attenuation factor, the capillary fringe must be considered one of the layers in equation J&E9a.

The capillary fringe is the zone immediately above the saturated zone where capillary attraction causes upward movement of water molecules from the saturated zone into the soil above; it contains more water than the rest of the soil above the water table. This zone is distinct in that it has characteristics of both the vadose and saturated zones. Because the capillary fringe impacts the migration of contaminants from the water table, it must be considered as a separate soil layer when developing remediation objectives for groundwater and a default thickness of 37.5 cm must be used. This value comes from the U.S. Soil Conservation Service soil texture classification table, which is also used by U.S. EPA for determining soil-dependent properties for the J&E model. In addition, the default water-filled soil porosity of the capillary fringe is assumed to be 90 percent of the total porosity of the soil that comprises the capillary fringe. The thickness of the capillary fringe and its water-filled soil porosity cannot be measured accurately in the field on a site-specific basis, which is why site-specific values are not allowed.

Subpart I: Tier 3 Evaluation

Section 742.900(c)(10) identifies the use of building control technologies – different from those presented in Subpart L – as a situation eligible for a Tier 3 evaluation. Site evaluators wanting to perform a Tier 3 evaluation for reasons of impractical remediation (Section 742.920) or exposure route exclusion (Section 742.925) for the indoor inhalation pathway are directed to follow Section 742.935.

Under Section 742.935, site evaluators may propose to exclude the exposure route; to use building control technologies different from those presented in Subpart L; to use calculations and modeling to establish soil gas remediation objectives; and to use calculations and modeling to establish soil remediation objectives.

Section 742.935(a) has changed substantially from the August 2008 proposal. The August 2008 version focused on the use of Qsoil where contaminants were within 5 feet of a building or manmade pathway. That discussion was made irrelevant by the addition of Appendix B, Table H and the amendments to Section 742.515. The November 2010 version is more open ended in terms of the types of Tier 3 proposals that can be considered.

Section 742.935(b) must be used when site evaluators propose a mitigation system that deviates from the building control technology requirements presented in Subpart L. This section identifies what information a site evaluator must submit to Illinois EPA to demonstrate the effectiveness of an alternative building control technology to prevent or mitigate indoor inhalation exposure risks.

In Section 742.935(c), site evaluators may propose to establish remediation objectives using soil gas data in lieu of the requirements of Section 742.227. One such difference is the use of sub-slab samples collected directly beneath a building foundation. Section 742.227 applies to exterior samples collected near the building, which is Illinois EPA's preferred approach as it is the least invasive. However, because sub-slab sampling is an accepted methodology nationwide, Illinois EPA decided to reference it specifically under Tier 3. This section identifies what information a site evaluator must submit to Illinois EPA to demonstrate the validity of alternative soil gas data in calculating indoor inhalation remediation objectives.

As noted earlier in my testimony, the Agency has dropped from Tier 1 and the Tier 1 Indoor Inhalation Tables (Appendix B, Tables H and I) the concept of using soil remediation objectives as a general methodology for predicting indoor inhalation risks. Here in Section 742.935(d) the Agency has left open the potential for a site evaluator to make a site specific demonstration that a soil remediation objective can be a meaningful predictor of indoor

inhalation risk. Of critical importance in this regard will be the ability of a site evaluator to make the mathematical and technical justification for the proposed model. (Section 742.935(d)(6))

Subpart J: Institutional Controls

In my earlier discussion of Tier 1 remediation objectives I noted that if a site evaluator uses Appendix B, Table I (Diffusion Only) then an institutional control must be placed to limit location of buildings and manmade pathways. Section 742.1000(a)(7) makes it clear that any time the diffusion only mode of transport is used (whether under Tier 1, 2, or 3) an institutional control will be necessary. Following is an example of an institutional control that could be included with the NFR determination when Appendix B, Table I (Diffusion Only) is used:

No building shall be constructed or occupied with the basement or lowest level X feet below the ground surface in the area indicated on the site base map.

The "X" referenced in the example above represents the distance that must be maintained to prevent the lowest level of the building from being located within 5 feet of the soil and groundwater contamination. Contamination located closer than 5 feet may exhibit an increased migration rate into the indoor space due to a pressure differential from the building. This would result in soil gas or groundwater remediation objectives that are not protective.

Section 742.1000(a)(8) requires the use of institutional controls whenever remediation objectives are based on a building control technology. Following is an example of an institutional control that could be included with the NFR determination when a building control technology is used:

No building shall be occupied in the area indicated on the site base map unless building control technologies are in place complying with 742 Subpart L: Building Control Technologies.

In some cases the site evaluator may request that a complete prohibition from buildings be a condition of the No Further Remediation determination. With the majority of sites, however, we expect that an institutional control like the one above will be preferred. This control would allow for the future construction and occupancy of buildings that have the appropriate Building Control Technologies provided in Subpart L.

Section 742.1015(j) prohibits the use of a groundwater ordinance to exclude the indoor inhalation exposure route. As described previously, an ordinance restricting the source of drinking water would not protect the enclosed air space of a building from the migration of contaminants in the groundwater.

Subpart L: Building Control Technologies

Building control technologies are designed to prevent the migration of volatile chemicals into enclosed spaces. They control unacceptable health risks due to vapor intrusion by reducing or eliminating the concentrations in the indoor air without necessarily reducing the residual concentrations in soil gas or groundwater. The objective of these measures is to make the indoor inhalation exposure route incomplete by preventing the migration of chemicals into a building. The November 2010 proposal duplicates the August 2008 proposal, except for the inclusion of an additional building control technology, vented raised floors in Section 742.1210(c)(4).

Section 742.1200 establishes the use of building control technologies as an acceptable final corrective action and requires that the site evaluator also comply with the provisions of Subpart J regarding institutional controls. This Section allows for no further remediation determinations to be made on building control technologies for buildings not yet constructed, provided that the approved technology is in place and operational before human occupancy. Site

owners and operators are required to maintain building control technologies; specific maintenance duties will be contained in the institutional control. In the event that the system shuts down, site owners and operators are required to notify building occupants and workers and implement protective measures to prevent exposure to the contaminants of concern. System inoperability may occur during routine maintenance or power failures. Contingency measures will be contained in the institutional control; this practice is consistent with provisions in place for engineered barriers used by the other exposure routes. Lastly, this Section states that the no further remediation determination may be voided if the building control technology is not maintained as stipulated in the institutional control.

Section 742.1205 lists the information to be submitted in a proposal to use any of the four mitigation systems under Subpart L.

Section 742.1210 defines the specific requirements for four mitigation systems: sub-slab depressurization, sub-membrane depressurization, membrane barrier systems, and vented raised floors. This Section specifically prohibits natural attenuation, access controls and point of use treatment from use as building control technologies. Also, building control technologies cannot be used as part of a Tier 1 evaluation.

Sub-slab depressurization is an active venting system that draws contaminated soil gas from beneath the building and expels it to the atmosphere. Sub-slab depressurization systems can be used for existing and new buildings. Sub-membrane depressurization is similar to the sub-slab depressurization system, but used for existing buildings with crawl spaces.

Membrane barrier systems are generally used for new building construction and serve to physically block the entry of contaminants into interior air space.

Vented raised floors have interconnected void systems that passively vent air flows from

beneath a slab to the outdoor air with the capability to convert to an active depressurization system. Vented raised floors are generally used in new building construction.

This concludes my testimony.