STATE OF ILLINOIS

IN RE: THE APPLICATION FOR	)	
APPROVAL OF THE DEKALB	)	
COUNTY LANDFILL EXPANSION,	)	Kishwaukee
	)	Community College
	)	
	)	DeKalb, Illinois
	)	March 4, 2010

Hearing commenced, pursuant to assignment, at 9:00 a.m.

BEFORE:

JOHN J. MCCARTHY, Hearing Officer.

POLLUTION CONTROL FACILITY COMMITTEE MEMBERS PRESENT:

Paul Stoddard
Ken Andersen
Michael Haines
Ruth Anne Tobias

REGISTERED OBJECTORS PRESENT:

Mike McIntyre
Roger Steimel
Clay Campbell
Dan Steimel

REPORTERS:

Julie K. Edeus and Callie Bodmer,
Certified Shorthand Reporters,
Dixon, Illinois.

APPEARANCES:

ATTORNEY DONALD J. MORAN,
of the firm of Pedersen & Houpt,
161 North Clark Street, Ste. 3100,
Chicago, Illinois, 60601-3242,

Counsel for Waste Management of
Illinois, Inc. as the Applicant.

ATTORNEY RENEE CIPRIANO,
of the firm of Schiff Hardin,
6600 Sears Tower,
Chicago, Illinois, 60606,

Counsel for DeKalb County.

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Witness: DALE HOEKSTRA

Witness: JOAN UNDERWOOD

Witness: DAVID MILLER

EXHIBITS

HEARING OFFICER MCCARTHY: Let's reconvene the public hearing. Mr. Hoekstra is still the witness. He remains under oath. I think when we adjourned last night we were going to allow some redirect by the Applicant. Is that right, Mr. Moran?

MR. MORAN: Yes, Mr. Hearing Officer, that's correct.

HEARING OFFICER MCCARTHY: You may proceed.

MR. MORAN: Thank you very much.

REDIRECT EXAMINATION

BY MR. MORAN:

Q. Mr. Hoekstra, during the course of yesterday's hearing you had been asked a couple of times about the level at which H2S could be detected or smelled by a human being. Do you remember some of that testimony?

A. Yes.

Q. And on the initial occasion you indicated that that odor threshold was one half part per billion and I believe later on you stated that it was five parts per billion and in fact, what you intended to say was what you said the first time which was that -- is that that level is one half part per billion; is that correct?

A. That's correct.

MR. MORAN: I just wanted to correct that. Thank you, Mr. Hoekstra. Nothing further, Mr. Hearing Officer.

HEARING OFFICER MCCARTHY: Okay. Thank you. Mr. McIntyre, do you have any additional questions of this witness?

MR. MCINTYRE: I do.

RECROSS-EXAMINATION

BY MR. MCINTYRE:

Q. Good morning.

A. Good morning.

Q. Yesterday you testified that you met with the Cortland Fire Department and discussed the effects of the expansion plans with them?

MR. MORAN: Objection, beyond the scope of my redirect.

HEARING OFFICER MCCARTHY: Overruled.

A. No. My testimony was that we had sent a letter to the Cortland Fire Department which is included in the application and that if this application would be approved the Cortland Fire

Department would be invited out to the facility to fully understand the construction of the new site, access points, locations of fuel tanks, things of that nature that would be relevant to their role in participating in any emergency response.

Q. Have you met with -- are you aware of an agreement between Waste Management and the town of Cortland?

A. Yes.

Q. Is there a provision for a $30,000 donation to the Cortland Fire Department?

A. Yes.

Q. Is there a provision for a one million dollar payment to Cortland?

A. Yes.

Q. Is there a provision for a one dollar per home per month administrative fee to the town of Cortland?

A. I'm going to have to refer to the agreement. Your reference to a one dollar per home per month administrative fee is cited on Page 2 of the agreement in Item B, discounted residential disposal fees. Upon the commencement of disposal operations within one year of receipt of the operating permit for the expanded area Waste Management will provide Cortland a discount of 10 percent on the rates it charges Cortland or Cortland's residential waste hauler for disposal at the DeKalb Landfill. In the event Waste Management is the successful bidder, Waste Management will rebate one dollar per home per month.

Q. Is Cortland's obligation -- is this accurate regarding Cortland's obligation that -- that would be on Page 3. Cortland agrees that it will not directly or indirectly take any action of any kind to oppose Waste Management's efforts to expand the DeKalb Landfill. In addition, Cortland agrees that it will not take any action of any kind to support any other party's opposition to Waste Management's effort to expand the DeKalb landfill; is that accurate?

MR. MORAN: Objection, calling for a legal conclusion.

MR. MCINTYRE: I'm asking if that -- this is the accurate --

HEARING OFFICER MCCARTHY: Are you asking if that's what the agreement says?

MR. MCINTYRE: Yes.

HEARING OFFICER MCCARTHY: You may answer.

A. Yes. It does say that.

Q. Okay. I want to move to another area. Could you explain what a perpetual care fund is?

MR. MORAN: Objection. It's not only beyond the scope of the redirect, it's beyond the scope of the direct.

HEARING OFFICER MCCARTHY: Overruled. I'm going to allow him to ask that question.

A. A perpetual care fund?

Q. Yes.

A. No, I'm not sure I understand the question. I'm not sure I understand what it is.

Q. Well, if I understood what it was I wouldn't ask, but I understand that they exist and -- and that they're common, so --

A. I don't understand what it is either.

MR. MCINTYRE: I have no further questions.

HEARING OFFICER MCCARTHY: Mr. Campbell?

MR. CAMPBELL: Thank you.

RECROSS-EXAMINATION

BY MR. CAMPBELL:

Q. Sir, I just have a couple of questions about the question you were asked on redirect by your attorney when he clarified in his question -- I think you had given two different answers and you clarified that the half a part per billion answer that you gave was, you know, the intended answer that you wanted to give; is that correct?

A. That's correct.

Q. And I want to make sure I'm clear here, sir. You're not an expert on H2S; is that correct?

A. Correct.

Q. You're not an expert on chemistry?

A. No.

Q. You're not an expert on air quality?

A. No, I'm not.

Q. In fact, you're not an expert on the entire issue of the acceptable level of H2S in the air?

A. No.

Q. In fact, you testified yesterday that you -- your background and your education did not include any H2S education; is that a fair statement?

A. Yes.

Q. As you sit there today, sir, are you aware of any person within Waste Management that you've had personal dealings with that could provide us with some expert testimony on the issue of H_2S?

A. I mentioned earlier yesterday that Joan Underwood, who's coming up next, is going to be speaking about that.

Q. Ms. Underwood will?

A. Yes.

MR. CAMPBELL: Okay. That's all I have.

HEARING OFFICER MCCARTHY: Okay. Thank you. Mr. Steimel?

ROGER STEIMEL: No questions.

HEARING OFFICER MCCARTHY: I don't see your son.

ROGER STEIMEL: He's not here yet.

HEARING OFFICER MCCARTHY: Okay. Ms. Cipriano, do you have any questions?

MS. CIPRIANO: No. Thank you.

HEARING OFFICER MCCARTHY: Do members of the Committee have any questions of this witness -- any additional questions? There was a gentleman who approached me prior to the hearing -- or prior to this morning's session that was not able to be here I think you said for part of the testimony yesterday and you may have a question; is that correct?

MR. MELLOTT: Yes, I do.

HEARING OFFICER MCCARTHY: Okay. Would you state your name and spell your last name for the record.

MR. MELLOTT: Certainly. My name is Kerry Mellott, M-E-L-L-O-T-T. I live at 22872 Malta Road just north of Kish College.

Mr. Hoekstra, in your testimony yesterday -- I did get here in time to hear a bit of it, but the session was late and so I had some questions that were unable to be answered yesterday, but I'd like you to be able to perhaps address them today. A lot of the testimony yesterday seemed to center around gases -- the release of gases, the generation of gases and you testified -- I would like to ask you if I'm correct on your testimony that this issue with hydrogen sulfide is something that was new -- that this is not a common problem; is that correct?

MR. HOEKSTRA: What I said was that the

way in which gypsum board has been handled in the industry has changed. As a result of recycling efforts throughout the State of Illinois, various communities and the legislative action that's taken place where communities are trying to attain higher levels of recycling, C and D recycling facilities, construction and demolition facilities have been started up and this material was going to those facilities in larger quantities and not -- being sorted and then ground so that it comes to the landfill in a different form. Construction and demolition material, wrecking material, all the different types of materials that fall under the definition of construction and demolition have always come into landfills, but the gypsum board in particular, the way that that has been disposed of in some cases has changed. So it's -- in that way it's new.

MR. MELLOTT: Okay, so the method of the disposal of gypsum board is new?

MR. HOEKSTRA: In some cases, not in all cases, but in some cases. In other words, not all gypsum board is being handled in that manner, but some of these C and D recycling facilities were, in fact, grinding it up.

MR. MELLOTT: If I recall correctly, you seemed to indicate that you had discovered this -- learned of a problem, this -- I think you called it a spike or peak in hydrogen sulfide generation -- the gas generation, that it was related to the gypsum board and as you've just said, that it was a different method a grinding of the gypsum board that you believed caused this; am I correct?

MR. HOEKSTRA: Yes, the grinding of the gypsum board, that's right.

MR. MELLOTT: Okay, so in that sense it's new, this is the new part of the gas generation?

MR. HOEKSTRA: It's directly related to the H2S gases.

MR. MELLOTT: Okay, and generally beyond the issue of ground gypsum board is hydrogen sulfide an issue at this landfill or other landfills that you are familiar with that you're a director of operations for?

MR. HOEKSTRA: Could you restate that question again?

MR. MELLOTT: Sure. I'm concerned with the hydrogen sulfide gas and based on your testimony yesterday and what you've just said now, I understand that the gypsum board -- the ground gypsum board in particular seems to be responsible for a part at least of the hydrogen sulfide generation and subsequent release. Now, I'm asking is -- is that -- do you believe that that's, for instance, the major or sole method of generation of hydrogen sulfide in this particular landfill?

MR. HOEKSTRA: Yes, I do.

MR. MELLOTT: Okay. I'd like to ask you a question about methane which I believe is the other gas that emits from landfills just in general and I would suppose in particular at the DeKalb County Landfill. What can you tell me about methane gas as far as your understanding of its properties?

MR. HOEKSTRA: Methane gas is a primarily odorless gas. Methane gas is primarily -- the gas that comes from landfills is primarily made up of methane gas and CO_2 and a small amount of other trace gases. Both the CO_2 and the methane are odorless.

MR. MELLOTT: Okay, so when folks around the landfill or wherever smell something and they believe it's coming from the landfill, what are they smelling if it's not methane if that is odorless?

MR. HOEKSTRA: Well, you may be picking up a small amount of the trace gases that are coming along with that or it could be directly related to the active operation of the facility itself.

MR. MELLOTT: The active operation meaning?

MR. HOEKSTRA: Meaning any waste that is being deposited throughout the day. If there's -- we talked about some sludge materials yesterday that could come in that might have an odor to them. Particularly wet waste materials, you know, on a rainy day could come in and might have a musty smell to them. Those types of things could possibly create an odor for a brief period of time.

MR. MELLOTT: So the front or the face of the landfill operation where the new material is going down could be generating gases including hydrogen sulfide and other gases?

MR. HOEKSTRA: That's possible, but more than likely it's going to be associated with the trace gases that may be coming along with the methane.

MR. MELLOTT: Okay. Trace gases other than hydrogen sulfide?

MR. HOEKSTRA: Yes.

MR. MELLOTT: So again, when folks smell the rotten egg smell or what is typically thought to be coming from the landfill do you believe they're smelling hydrogen sulfide or are you saying they're smelling some other trace gas?

MR. HOEKSTRA: Well, I think in this case there's -- there's definitely a hydrogen sulfide odor that was associated with the problem that we were having.

MR. MELLOTT: Okay. Also, yesterday in your testimony, as I recall, you made mention of this issue of hydrogen sulfide at other landfills. Could you characterize again for us today the generalization of hydrogen sulfide emissions from other landfills, is it a problem or has it been known to occur in other landfills?

MR. HOEKSTRA: It has been known to occur in other landfills and currently is an issue at some other facilities. We had the issue at our Countryside landfill which we've mentioned briefly here in previous testimony. The Orchard Hills facility, which is operated by Veolia, is currently having an H2S issue. The Winnebago reclamation facility also has an odor issue that they are dealing with and I believe is directly related to the acceptance of ground gypsum board, because as soon as we terminated use -- or acceptance of that material that material was continuing to be generated and went to some other facilities. We terminated it across all nine of our facilities immediately as soon as we knew what the cause of the issue was.

MR. MELLOTT: Do you believe that the gypsum issue, if I could call it that here at this landfill, is a common occurrence at other landfills and if it is is that the most likely reason for generation of hydrogen sulfide or would there be other reasons?

MR. HOEKSTRA: No, I think that is the primary reason for the generation of H2S.

MR. MELLOTT: So then if the ground gypsum could be kept out of all landfills then there would be no odor issue because you would not be able to smell hydrogen sulfide being generated from the ground gypsum?

MR. HOEKSTRA: There wouldn't be an odor associated with H2S.

MR. MELLOTT: Regardless of the ground gypsum?

MR. HOEKSTRA: No, if we terminate acceptance of ground gypsum there wouldn't be --

MR. MELLOTT: There would not be --

MR. HOEKSTRA: -- the odor of H2S, that's correct.

MR. MELLOTT: So then I guess by inference we're saying that any landfill that has an H2S emission or an odor problem that's presumably caused by H2S must be taking in ground gypsum?

MR. HOEKSTRA: In my opinion that's -- from my experience in this case and the case of Countryside, that's my experience. I can't speak to all --

MR. MELLOTT: So within your experience --

MR. HOEKSTRA: Within my experience, within my area of responsibility, what I know, that's what I believe is the case.

MR. MELLOTT: Okay, fine, thank you. I have another few questions regarding the gas issues. One being the cell building. I was quite intrigued by your slides yesterday --

MR. HOEKSTRA: Sorry, I didn't --

MR. MELLOTT: The cell building.

MR. HOEKSTRA: Yes.

MR. MELLOTT: For the others who may not have heard it, I'm speaking about the method that you use to build the trenches or the areas that contain the landfill material. I'm curious about how those are built. Yesterday you mentioned something about the liner and from your pictures we could see that there was some sort of a sheath or a plastic film or something that was at the bottom and I didn't see whether there were any on the sides. Could you briefly tell us how that's constructed?

MR. HOEKSTRA: Is this the -- did you see this slide?

MR. MELLOTT: Yes, exactly, that's what I was thinking of.

MR. HOEKSTRA: This is the excavated area of the cell construction and the soil is excavated out, a 3-foot base, before this liner is installed, is recompacted and once that's completed then that surface is rolled with a steel-drum roller. It's a very smooth surface here. All the protruding rocks are then picked up by manual labor prior to this deployment of this 60 mil liner. The 60 mil liner is then deployed, the seams are welded together and tested and then the leachate -- then a cushioning layer is placed across the surface of the 60 mil liner, leachate gravel is then placed on top of that, that is a foot thick and then there's a filter fabric that lays over the top of that surface and is sewn in panels together and all of that -- as Mr. Nickodem testified at great length in his testimony for the design, all of that information is observed and recorded by a quality -- construction quality assurance officer who has to submit a report, a professional engineer has to approve that report and that is sent to the Illinois EPA for their review and approval. The EPA will actually come out and inspect the cell to make sure that it's been constructed correctly before they then approve that particular cell for disposal.

MR. MELLOTT: Okay. Thank you. I missed Mr. Nickodem. Is that the name?

MR. HOEKSTRA: Nickodem.

MR. MELLOTT: Nickodem. I missed his testimony unfortunately, but perhaps I could ask you one or two questions that perhaps you'd be familiar with as an operations director. Do you watch, oversee in any way -- are you involved with the cell construction?

MR. HOEKSTRA: Sometimes I'm involved in construction activities, but the nine facilities that I operate have managers who are directly responsible for those activities and watch over those activities, so they report to me.

MR. MELLOTT: I think you said you've been involved in this for something like 34 years; is that correct?

MR. HOEKSTRA: Correct.

MR. MELLOTT: So in that length of time you've probably seen a number of these cells being constructed in various phases of construction?

MR. HOEKSTRA: Yes.

MR. MELLOTT: In your experience how frequent is it that the liner is -- there's a problem of some sort with the liner, the material is not up to spec or a rock has punctured the liner -- how frequently are there problems with the installation of the liner?

MR. HOEKSTRA: I haven't had any problems with the liners.

MR. MELLOTT: Not whatsoever --

MR. HOEKSTRA: None.

MR. MELLOTT: -- in 34 years, that's an outstanding record. Can you tell me -- I understand you're not the design engineer, but can you tell me essentially what that liner material is made of?

MR. HOEKSTRA: It's a 60 mil HDPE. In this case I think we're dealing with a textured liner on both sides, but I'm not the design engineer so I don't have all those specific answers.

MR. MELLOTT: I understand. So then that is in the application packet which I understood yesterday to be 6,000 pages, is that correct, 6,000 pages or so?

MR. HOEKSTRA: It's 6,790 pages.

MR. MELLOTT: Okay. Within that volume is there a QC plan or a QA plan for cell building and in particular for the installation of liners?

MR. HOEKSTRA: I'm not exactly sure if it's included in the application. I would have to actually look to see if it's in here. I believe it is. I don't know if it's in here. I'm sure it is, but I can't find it at the moment because it's not part of my testimony.

MR. MELLOTT: Whose part of the testimony would that have been?

MR. HOEKSTRA: That would have been Mr. Nickodem.

MR. MELLOTT: So if I look in the written record I should be able to find that QA plan?

MR. HOEKSTRA: Yes.

MR. MELLOTT: Okay. Are you familiar with the Centers for Disease Control, a government agency?

MR. HOEKSTRA: Only by name.

MR. MELLOTT: Okay. I was looking in the data and the available information on gas emissions from landfills and I came upon an interesting statement. I think you mentioned a landfill a few moments ago in New York that has a problem with hydrogen sulfide emission --

MR. HOEKSTRA: I didn't mention any landfill in New York.

MR. MELLOTT: Oh, you did not. I misheard you then. All right. Are you familiar with the Fresh Kills Landfill in New York?

MR. HOEKSTRA: Only by name.

MR. MELLOTT: Okay, but you are aware that it exists?

MR. HOEKSTRA: Yes.

MR. MELLOTT: Okay. In the document that I came across from the Centers of Disease Control and more specifically the Registry of Toxic Substances, I came across a statement from them -- from the Centers of Disease Control that landfills in general -- this is not a specific statement about any one landfill, but a general statement made in their documents that landfills typically can produce up to 1 percent by volume of hydrogen sulfide. Are you familiar with that statement or with any literature or data --

MR. HOEKSTRA: No.

MR. MELLOTT: No, okay. All right. I'd like to move to another question in another direction here and that's about elevation. Mr. Hearing Officer, yesterday this question was asked and you sustained an objection to it I believe, if I remember correctly. I would like to restate the question regarding elevation and ask Mr. Hoekstra in his experience whether elevation has had not an aesthetic impact regarding these landfills, but rather a functional one. So Mr. Hoekstra, my question would be as the elevation of the landfill increases and you move the front -- the dumping area higher off the surrounding ground in your experience have you noticed or had any issues with wind, in particular with turbulence, various directions of wind?

MR. HOEKSTRA: In regard to --

MR. MELLOTT: The elevation. Is there a -- you know --

MR. HOEKSTRA: Impacting the operation?

MR. MELLOTT: Yes.

MR. HOEKSTRA: No.

MR. MELLOTT: And another question. As the elevation increases from, say, you know, the surrounding grade upward is there an issue with regard to the hydraulic head, the amount of pressure -- or perhaps first I should ask you to describe for us if it's within your expertise a definition for hydraulic head?

MR. HOEKSTRA: Mr. Nickodem would have to answer that question because he's -- he's already testified to that. He's the design engineer and can answer your questions regarding hydraulic pressures and heads.

MR. MELLOTT: Would that be within the purview of your geologist?

MR. HOEKSTRA: She may be able to answer that question.

MR. MELLOTT: Okay. I'll reserve my question for her then. So then one more question from me, if you will. You mentioned that you had -- or someone mentioned this morning regarding the Cortland Fire Department. I'd like to ask you a few questions about fires at landfills. In your experience of 34 years have you ever had -- been involved with any kind of fires at landfills?

MR. HOEKSTRA: We had -- the only experience I've had with fires at landfills are directly related to hot loads that come in which those are set off to the side and I described that process earlier -- or the procedure earlier where a truck would come in with a hot load, we'd push it off to the side and immediately put that fire out by covering it up with dirt and smothering the flames. We have not had any major fires as a result of any other issues.

MR. MELLOTT: Okay, so are you aware if not within your own landfills, the ones you're in charge of or oversee, are you aware of in the industry an issue with any sorts of fires at landfills, in particular below-grade fires?

MR. HOEKSTRA: I know that they generally can occur. It's possible that they could occur -- underground fires.

MR. MELLOTT: And how would that be dealt with if that did occur?

MR. HOEKSTRA: Well, in those cases typically what happens is you've got some -- too much infiltration of oxygen from the surface through the gas recovery system which then begins to create an underground surface fire. In the case of that situation the way to resolve that problem is to back off your gas recovery well. So if that were to happen there's too much vacuum being placed on the landfill itself pulling oxygen through the surface and creating a situation in which an underground fire could occur. You have to immediately back off that vacuum, make sure you don't have any areas where there's an infiltration of oxygen through the surface, maybe cracks in the daily cover -- or I'm sorry -- the intermediate cover or final cover area bringing in oxygen through that situation.

MR. MELLOTT: So your methane recovery system has an impact on the probability of an underground fire?

MR. HOEKSTRA: It could if it's left -- if it's not controlled properly.

MR. MELLOTT: Could the reverse happen? Could a fire have an impact on the methane recovery system?

MR. HOEKSTRA: Not likely, but I haven't had that experience so I really can't speak to it.

MR. MELLOTT: Again, I understand you're not the design engineer, but your experience I would imagine would tell you. Are there any sorts of storage facilities for methane or other flammable gases at landfills?

MR. HOEKSTRA: No.

MR. MELLOTT: It's all flared off, you collect it in headers and pipes and so on and it's immediately burned?

MR. HOEKSTRA: In the landfills that I operate, yes.

MR. MELLOTT: Okay. All right. Thank you. That's all the questions I have.

HEARING OFFICER MCCARTHY: Okay. Any other questions of this witness? Mr. Moran, anything additional?

MR. MORAN: No further questions,

Mr. Hearing Officer.

HEARING OFFICER MCCARTHY: Mr. McIntyre?

MR. MCINTYRE: Just one.

FURTHER RECROSS-EXAMINATION

BY MR. MCINTYRE:

Q. Do you have any specialized training in fire -- fire training?

A. Just the training that we provide our employees and we bring in -- sometimes we'll cooperate with the local fire department and have them come in and train our employees on fire fighting. We'll bring in fire extinguisher professionals to teach our employees how to operate fire extinguishers and use them on a fire effectively. That type of training is the training that we provide our employees.

Q. Is there any kind of certification there?

A. Typically you get a certification from the fire extinguisher professional when he trains you, yes.

HEARING OFFICER MCCARTHY: Mr. Campbell, anything further?

MR. CAMPBELL: Just briefly, sir.

FURTHER RECROSS-EXAMINATION

BY MR. CAMPBELL:

Q. Do you have any specific certifications that you've received as a result of your fire training?

A. No, I don't.

MR. CAMPBELL: Okay. That's all I have.

HEARING OFFICER MCCARTHY: Mr. Steimel?

ROGER STEIMEL: None.

HEARING OFFICER MCCARTHY: Okay. Ms. Cipriano?

MS. CIPRIANO: None. Thank you.

HEARING OFFICER MCCARTHY: Members of the Committee? Any members of the County Board who may be present? Anyone else have any further questions of this witness? Okay. Seeing none, you're excused, Mr. Hoekstra. You may call your next witness, Mr. Moran.

MR. MORAN: Thank you, Mr. Hearing Officer. We'd call Joan Underwood. If we could just have a minute or so -- you're all set.

JOAN UNDERWOOD,

being first duly sworn, was examined and testified as follows:

HEARING OFFICER MCCARTHY: You know, just a housekeeping measure, I'm not sure that we admitted the resume of Mr. Hoekstra.

MR. MORAN: And we didn't for Poletti either. I was going to offer all those at the end, but we could offer both of them now which are Petitioner's Exhibit 7 and 8.

HEARING OFFICER MCCARTHY: Any objection to the admission of those exhibits? Hearing none, they will be admitted.

(Petitioner's Exhibit Nos. 7 and 8 were admitted into evidence.)

DIRECT EXAMINATION

BY MR. MORAN:

Q. Could you tell us your name please and spell your last name for the court reporter.

A. My name is Joan Underwood, U-N-D-E-R-W-O-O-D.

Q. Ms. Underwood, what is your business or occupation?

A. I'm an environmental manager and hydrogeologist.

Q. How long have you been a hydrogeologist?

A. 32 years.

Q. Could you tell us what a hydrogeologist is and what you do?

A. Yes. A hydrogeologist is a specialist in geology that looks at the movement of water through the different geologic materials in the subsurface.

Q. Are you employed?

A. Yes, I am.

Q. By whom?

A. Quantum Management Group.

Q. Okay. What is Quantum Management Group?

A. Quantum Management Group is an environmental management company.

Q. And what position do you hold with Quantum Management?

A. I'm a senior associate.

Q. Now, Ms. Underwood, you're going to talk to us today about the geologic and hydrogeologic conditions out at the expansion site; is that correct?

A. Yes.

Q. And that essentially relates to Criterion 2 or at least part of Criterion 2?

A. Yes, it does.

Q. Before we get into that evaluation and analysis, let's cover your background and qualifications. What is your education?

A. I have a bachelor's of science degree from the University of Wisconsin at Oshkosh and a master's of science degree from the University of Idaho.

Q. Could you describe for us your professional experience?

A. Yes. I have 32 years of experience working in a variety of different groundwater problems ranging from groundwater supply issues to groundwater contamination issues and looking at facilities to be sited or placed in areas and their potential impact on groundwater.

Q. And does that experience include working on remediation programs and projects at those sites?

A. Yes, it does.

Q. Could you describe now for us your experience in performing hydrogeologic site characterization?

A. Yes. I've done site characterizations all over the country and a little bit outside of the country. And those consist of looking at and investigating the subsurface conditions to understand the different geologic units below the site and then, again, how the groundwater moves through those different materials and that includes also developing monitoring programs to be able to look at the conditions in the subsurface.

Q. Okay. Is it important to analyze or review geologic and hydrogeologic site conditions at a specific location which has been proposed for a solid waste disposal facility?

A. Yes.

Q. And why is that?

A. There's a number of reasons. The main one being so that you can develop an appropriate monitoring program to -- to monitor the performance of the design site, but also just to understand groundwater movement, where it's located and the conditions below the site and provide the engineers information also.

Q. Are there regulations in place that require geologic characterization of a proposed landfill site?

A. Yes, there are.

Q. And do those regulations specify or require specific types or thicknesses of geologic material at a site?

A. No, they do not.

Q. What do those requirements specify or provide?

A. The requirements -- and in Illinois they're the 8-11 requirements -- require that you understand the different subsurface conditions so that you understand flow direction, movement and the types of materials below the site.

Q. And is that information then used in the design of the landfill or the landfill facility?

A. Yes, mainly, again, for the groundwater monitoring program and for some of the engineering work.

Q. Okay. Have you designed groundwater monitoring systems for landfills?

A. Yes, I have.

Q. Could you describe that experience for us -- in other words, how many of these have you done and for what types of facilities?

A. Sure. I've probably done upwards of 30 or more sites, again, across the country and those are related to either existing landfill sites or old landfills that needed monitoring programs developed or were investigated through monitoring programs.

Q. Now, we've heard over the course of the last couple of days a lot of questions and discussions about H2S. In your work on remediations and hydrogeologic site characterizations at these landfill sites have you become familiar with H2S?

A. Yes.

Q. And what is H2S?

A. H2S is hydrogen sulfide, it normally forms as a gas.

Q. Is it a naturally-occurring substance?

A. Yes. Hydrogen sulfide is formed naturally under a number of different conditions. The main one being from the production caused by hydrogen -- or sulfur-producing bacteria. I encounter issues with hydrogen sulfide in a number of different ways. First of all, just working in groundwater people ask me sometimes when their water smells, you know, what that is from and in naturally-occurring groundwater you can get hydrogen sulfide and sometimes people that have wells will smell that smell in their water and then they just want to know what that is and if it's a concern and it's usually not a concern. The other way is working on landfills and waste facilities where we always have to put in place health and safety plans that recognize the potential hazards at a site. At landfills hydrogen sulfide gas is produced and so it is important to recognize, one, that it's produced and then prepare health and safety plans that address the potential to encounter hydrogen sulfide gas. And on every landfill that I've worked on there's a health and safety plan. I've developed some of those, reviewed some of those and implemented those and acted as health and safety officer.

Q. Other than at landfills where else do we find hydrogen sulfide -- where else is it produced? Where else do we see it?

MR. CAMPBELL: Mr. Hearing Officer, could we have her resume? Just -- if we could ask Counsel to provide that so we can have the benefit of her background.

HEARING OFFICER MCCARTHY: I'm sure that he'll get to her resume here shortly.

MR. CAMPBELL: He's just asking a lot of real scientific questions and I'm not sure of her qualifications, so it might just benefit us -- save some objections in regards to her expertise if I had her resume.

HEARING OFFICER MCCARTHY: I think she stated her qualification, but if you have no objection, Mr. Moran, to passing them out now --

MR. MORAN: Well, as you pointed out, Mr. Hearing Officer, we're certainly in the process of getting there. We'll certainly provide that resume in due course and if Counsel has issues with Ms. Underwood's qualifications he'll certainly have ample opportunity once we present that resume to be able to review it and ask her questions about it and it will be in a few moments, so we won't be too much longer.

MR. CAMPBELL: It just seems like we went from background and now we're asking her some very particular questions in regards to her expertise and I'm not -- it seems like we're getting the cart before the horse, but I'll wait.

Q. I'm sorry. Ms. Underwood, do you recall the question that was pending? I had asked you about where else do we find H2S, because all the focus here has been on, you know, H2S at landfills, but in fact, as you pointed out, it's a natural-occurring substance, we find it everywhere, you know, we produce it as human beings, for goodness sake. Where else do you find H2S -- or where else do we find H2S?

A. The main places of concern that H2S has typically been a very important safety issue is waste water treatment plants where you have sludges that produce H2S and at animal facilities that have manure pits or areas where the manure can produce H2S. It's also found in the human body. Your mouth naturally produces H2S and they've taken measurements of up to a hundred parts per billion of H2S in people's mouths. So it's a constituent that, again, is found pretty much everywhere. The last issue of -- or the current issue of Scientific America, in fact, has an article on H2S, it's titled Toxic Gas Lifesaver and it talks about the benefit of having quantities of hydrogen sulfide in your body. Now, it's been a concern -- it's a health and safety concern at very high concentrations because the gas at high concentrations can kill you. And so people that work in those industries like people at waste water treatment plants, around areas of manure have to be careful that they do not get exposed to high concentrations of hydrogen sulfide gas. And so -- and at landfills it's important too because, again, the gas can be produced. It's a gas that's heavier than air and so when you have confined spaces that air -- that hydrogen sulfide cannot mix with air and be diluted to levels that are acceptable to breathe and so people have to be able to monitor those confined spaces mainly so that the exposure is not high enough to have industrial accidents as a result of the hydrogen sulfide.

Q. So what you're saying, Ms. Underwood, is that hydrogen sulfide can be harmful, correct?

A. Yes.

Q. But it is generally harmful under circumstances in which there is a confined space so that an individual who is exposed would not have maybe the opportunity to have those levels or concentrations dissipated as that gas moves through the air; would that be accurate?

MR. CAMPBELL: Mr. Hearing Officer, I'd like to object again. We're being asked for expert opinions from this witness. I do not believe she's been qualified as an expert at this stage and I still think it's unfair for Counsel to ask questions in regards to expert opinions in regards to H2S without us having the benefit specifically of her resume which I'm understanding is going to be tendered. I'm still not understanding why we can't receive that yet and it puts us at a particular disadvantage, Mr. Hearing Officer, because I'm not sure whether she's qualified to render the opinions that she's making.

HEARING OFFICER MCCARTHY: I'm going to overrule the objection. You're going to have ample opportunity to cross-examine this witness and you will have her resume in front of you and I will give you a sufficient amount of time to review her resume if you would like that time.

MR. CAMPBELL: Thank you.

HEARING OFFICER MCCARTHY: Overruled. You may continue.

MR. MORAN: Thank you, Mr. Hearing Officer.

Ms. Underwood, under what circumstances is H2S harmful?

A. When you reach levels upward of 100 or 500 parts per million the concentration is great enough that you could die from exposure to that concentration. Now, hydrogen sulfide is smelled at a very low level and just to try to give some perspective on the types of levels that we're talking about of what's naturally found in your mouth, found in the air and what you can smell, I just wanted to show those numbers so you can see that. So this slide typically -- and I think as Mr. Hoekstra testified to, you can smell hydrogen sulfide gas at a half a part per billion in air and so a half a part per billion is shown right here, point five parts per billion. If you put that into a ratio, because it might be easier to understand, it's point five over a billion or five over ten billion. So the nose is very sensitive to being able to detect the odor from hydrogen sulfide. The

concentrations where it's lethal is 500 parts per million. It's immediately of danger at 100 parts per million and so that would be much -- tens of thousands of times higher than what you can smell it at.
Q. Now, Ms. Underwood, do you hold any professional licenses?
A. Yes, I do.
Q. Could you describe those for us?
A. Yes. I am licensed as a professional geologist in the states of Illinois, Wisconsin, Minnesota and Indiana. I have a professional hydrology license in the State of Wisconsin. I'm a professional hydrogeologist through the American Institute of Hydrology. I'm a certified groundwater professional through the National Association of Groundwater Scientists and Engineers and I'm a certified professional geologist through the American Institute of Professional Geologists.
Q. Okay. Have you taught any courses in hydrogeology and groundwater monitoring?
A. Yes, I have. I've taught environmental geology, hydrogeology, engineering geology and

then a course related to the hazardous waste program at the Lakeshore Technical College in geology, meteorology and mapping. I've also taught a number of courses through the University of Wisconsin Extension Center and then have taught the previous courses that I mentioned at a number of campuses through the University of Wisconsin system.

Q. Have you published any articles relating to hydrogeology and groundwater monitoring?

A. Yes. I've published or presented probably at least 50 articles related to hydrogeology, geology and most recently vapor intrusion issues related to vapors in the subsurface.

Q. Have you published articles with respect to landfill gas?

A. Yes.

Q. And that would be similar to the article you just identified on vapor intrusion and others as well?

A. Yes.

Q. Are you a member of any professional societies or organizations?

A. Yes, I am.

Q. Can you identify those for us, please?

A. Yes. Those include the Geological Society of America, American Institute of Professional Geologists, American Institute of Hydrology, the National Association of State Boards of Geologists, American Water Resources Association. I think that's the majority of them.

Q. Have you held any positions of authority within these organizations?

A. Yes, I have. I've been committee chairs on a number of different committees and I'm also past president of the National Association of State Boards of Geologists.

MR. MORAN: May I approach the witness, Mr. Hearing Officer?

HEARING OFFICER MCCARTHY: You may.

(Petitioner's Exhibit No. 9 marked for identification.)

Q. Ms. Underwood, let me show you what we've marked as Petitioner's Exhibit No. 9. Will you take a look at that, please. Can you tell us what Petitioner's Exhibit 9 is, Ms. Underwood?

A. It's a copy of my resume.

Q. And in fact, this is an abbreviated version of your resume, isn't it?

A. Yes.

Q. You had given me a much longer resume that I believe was 12, 13 pages and listed every publication and a number of other items that we haven't included here, so this is, in fact, a true and accurate version of a summary of your educational background, employment history and professional experience; would that be correct?

A. That's correct.

Q. Now, Ms. Underwood, is there a written report that describes and sets out the geologic and hydrogeologic conditions at this site?

A. Yes, there is.

Q. And is that written report contained in the siting application previously admitted as Petitioner's Exhibit 1?

A. Yes, it is.

Q. I believe that's in Volume 1 of the application; would that be correct?

A. That's correct.

Q. Ms. Underwood, what was the purpose of the work that you performed in this project?

A. I was asked to evaluate the geologic and hydrogeologic conditions at the proposed site.

Q. And how did you go about doing that?

A. I did that through a number of steps and activities that included developing -- researching background information, developing an investigative program, doing the investigation and then evaluating that information.

Q. Okay. Why is it important to know the hydrogeology and geology at a site?

A. It's important to understand the geology and hydrogeology of the site, first of all, as I mentioned previously, because we need to be able to develop a groundwater monitoring system for the site that monitors the performance of the landfill. Secondly, it provides information that is used by the design engineers to look at and design the landfill. That includes such things as using that information to set base grades, looking at the soil properties that are beneath the site so that they can do their geotechnical analysis, looking also at those different soils and their properties to look at that from a construction standpoint and to look at the amount of materials available at the site for the construction of the proposed landfill and then also to be able to look at the groundwater system in conjunction with the surface water management system.

Q. Now, specifically what did you do to go about characterizing this site?

A. Before you go out in the field the first thing you want to do is understand what information is available, so that's where I started as I would start with all my projects. I looked at available regional, local and site-specific information to get a basic understanding of what the site conditions were like. From that information then I could design a groundwater and geology investigation program. So I designed a program then to investigate the subsurface and it allowed me to design a program specific to the conditions that I expected and specific to what I knew about the site by looking at available information. During the investigation then I collected information that was sometimes sampled and sent to the laboratory for analysis. I understood the geologic history at the site and then from that I could develop a site conceptual model meaning a picture of what the subsurface was like and how groundwater moved through the subsurface.

Q. And did you perform any tests to help in the development of that site conceptual model?

A. Yes. I did a number of tests including some small pumping tests or hydraulic testing of the subsurface to look at some of the groundwater conditions.

Q. Now, Ms. Underwood, is it important to know the geologic history or in fact, the processes that occurred at this site or in this area?

A. Yes, it is.

Q. And why is that?

A. It's important to understand the geologic history because it gives you a basic picture again of what the subsurface is like.

Q. And did you review the geologic history and processes at this site?

A. Yes.

Q. And could you tell us about how you did that and what you determined?

A. Yes. If I could start with explaining the geologic history of the different rock deposits at the site. We have both rock materials below the site and soil materials. And when I say soil materials I just mean all the unconsolidated sediment type of materials. So if we look at the upper bedrock that's found beneath the site, it's sedimentary bedrock. And the type of bedrock that is found beneath the site was formed in an ocean. And so if we understand how it was formed we can understand the types of properties that we would expect to see in those different rock formations. This is a picture of how the different sedimentary rock layers develop in an ocean environment. So you have an ocean that at one time was over this area. When you have sediments that are deposited near the shore of the ocean you deposit courser sediments, the sandy materials and so you lay down a layer of sand. As the wave action decreases and the water becomes deeper the smaller sediment particles can settle out and you deposit mud materials. And then finally when you get in the deep ocean you deposit a limey mud material from the skeletons of small animals. And so you can start having an understanding of the types of materials that would be beneath this site. Now, these sediments over time get laid down and turned into rock so that sand becomes sandstone, the mud becomes shale and the limey mud becomes limestone. Now, over time the ocean moves -- the shoreline moves in and out as the water levels move up and down. So if the ocean would transgress and come out and the shoreline would be up in this area you would have mud laid down first and then if the shoreline was here sandstone would be laid down on top of it, sand would be laid down and then it would be lithified or turned into sandstone. So you would expect to find a series of these types of rocks in the kind of sedimentary environment that we are in. And in fact, that's what we see beneath the site.

Now, the process of laying down those types of layers occurred over hundreds of millions of years. At some point the ocean receded out of the area and erosion started to take place. As the erosion occurred then it developed land forms on the ground surface. Just like you can look out at the ground surface now and you see river valleys and high points and low points, the bedrock surface was developed like that over, again, millions of years. At the time that that erosion ended we had bedrock in the area that had developed a certain configuration to it, a certain topography to it. This is a picture of the site area. And again, the site is outlined in blue. And what this is is a contour map of the top of the bedrock below the ground surface. So bedrock is found, oh, between about 50 to 90 feet. So this is what's buried in the subsurface at the ground. Now, these contour lines, the dark ones, represent a change of 10 feet in the -- in the bedrock surface and we can see that the bedrock surface changes over the area of the site. So if we start here, this is the high point in the bedrock and count downward we have 10, 20, 30, 40, 50, 60, 70 feet of topography or change in the level of the bedrock across the site area. You can see that also represented by this line on the bottom which is a profile. So if you could cut into the subsurface you can see the bedrock over on the east side is higher than the bedrock surface over on the west side. And again, remember, this surface is buried. This isn't what you see at the ground surface. This is what the surface of the bedrock underneath the site looks like.

So the point of this is that the erosion that occurred over millions of years resulted in a bedrock surface that slopes from the east area to the west area.

Now, we can look at the same thing for the deposits on top of bedrock. So after this long erosional phase occurred glaciers moved into the area about two million years ago. So if we look at the conditions that occurred when the glaciers moved into the area there is a whole series of times that the glacier moved in and out of the area over the last two million years. The most recent advance in the glacier in the area occurred about 25,000 years ago. And the deposits that were laid down during that last glacial advance are the most well preserved on the ground surface because they were the most recent. And we can look at how those deposits are at the ground surface and figure out how the glacier moved and where it stopped as it advanced into the area and retreated into the area. The last period of time when that occurred, again, in about the last 25,000 years, is called the Wisconsinan period. And during the Wisconsinan period the glacier moved to a maximum extent of this line shown on the left-hand side of the picture and this is -- this is the farthest that the glacier went during the last Wisconsinan advance. So as the glacier moves into the area it deposits sediments as it melts out of the glacier. And when the glacier sits at a point and stays there for a little while the ice continues to bring in sediments and it builds up a ridge at the front or the maximum extent of the glacier. Those ridges are called moraines. And so you'll see on the map that's on the board right now that there's a series of things called moraines or morainic systems that represent areas where the glacier had stopped long enough to build up these ridges. Now, when these advances occurred they're laying down sediment. So if we understand how the advances occurred we have some idea of the type of layers that we would see in the sediments beneath the site.

Now, there's another surge of the glacier that came, again, across the state during the last event, but it stopped short of the previous advance. And it stopped in this area shown by the second brown line on the slide and you'll notice that it crosses the site area. And so we know that one surge of the glacier went completely across the site. The second surge only made it partway across the site. Each time that those glaciers move they lay down a series of deposits and those deposits are given different names. So the next slide simply shows a similar picture to the previous one, but it labels the different layers of sediments that are laid down when that glacier advances over the area. You can see by looking at the slide that the advance that went to the maximum extent, again, shown by the line that's over on the west portion of the picture, that that material is called the Tiskilwa formation. The formation that came next is called the Lemont formation. So the point of this slide is really to let you understand that each of these sediment layers laid down can be given a specific name and can be identified based on certain properties of the different materials. Again, it's important when looking at this slide to notice that we would expect to see Tiskilwa formation beneath the site because it was deposited in this entire area. And we would expect to see Lemont formation over a portion of this site because it was deposited during the second advance -- or the second surge in the glacier.

Q. Now, Ms. Underwood, you've indicated that you conducted a site-specific investigation here as well; is that correct?

A. Yes.

Q. What did that site-specific investigation consist of?

A. When I designed the site investigation I started by laying out a boring program. Borings are just the things that you drill into the subsurface to be able to collect soil and rock samples and identify the different units below the site. From the samples that come out of the bore holes then I can classify the soil and rock materials. For the soil materials specifically there's samples that are sent to the laboratory. They are subjected to a series of tests including grain size tests that allows us to look at the distribution of the different material sizes. Atterberg limits which is an engineering test that looks at how the material acts at different moisture contents. The permeability of the materials -- excuse me -- which just means the ease with which water can move through them and the moisture content.

I also installed series of piezometers. A piezometer is simply a small-diameter well that's put in the subsurface to be able to measure the pressure head at different depths within the subsurface. That tells me something about the groundwater in those materials. I also conducted field permeability tests. So these tests are done on those piezometer installations and they look at, again, the conditions and the ease with which the water can move or not move through the different materials. Those tests were conducted in the field both on the soil and the rock.

We also collected groundwater chemistry and the groundwater chemistry data is important because, again, it helps to tell us how groundwater moves. As groundwater moves through the subsurface it picks up natural minerals that are contained in the soils and the rocks and by looking at the chemistry of that we can say here's the different groundwater flow systems.

And then finally in some of the deeper bedrock holes we did some bore hole geophysics. All that means is that a tube was sent down into the boring that remotely senses conditions in that boring to look at the different rock layers. What we were looking for was really the type of materials that were in that bore hole.

Q.   Ms. Underwood, did you then use the information you obtained from this site investigation in describing the geology at the site?

A.   Yes.

Q.   And could you explain for us, please?

A. Yes. Again, this is a picture of the site area and the first slide shows the location of all the borings that were completed across the site. So you can see that there's borings that have been taking -- taken across the entire site area except for where the existing landfill exists. From these borings there's a select number of those borings that were then converted with piezometer installations or those well installations to collect additional groundwater information. And at most of these blue dots representing those piezometer locations there are multiple wells, so there's wells at different depths to collect information in the different geologic formations.

From the information collected from those borings and wells then we construct geologic cross sections. And there is a series of geologic cross sections developed across the site area. And you'll see by these black lines shown on the drawing that these cross sections were developed both in an east/west and a north/south direction. Now, a geologic cross section is really just a depiction of what a cut in the subsurface would look like. So at each of those locations of the cross sections I'm taking a slice into the earth and constructing what the different layers are beneath the site. The next picture shows what a cross section depiction looks like. And if you look at Cross Section CC prime it goes through the entire site area in an east/west direction. So I'm going to show you then what was constructed for the different layers in the subsurface based on what we saw in the borings. Now, if we draw a geologic cross section to scale it looks like the picture depicted on this slide. The geologic layers are very hard to depict. So when we construct geologic cross sections we have to vertically exaggerate or stretch out the picture in the vertical direction so you can see the different layers. And so that's what we're doing here is just exaggerating in the vertical direction so you can see what the different layers are. Now, again, before I ever went out to the site I had some idea of the different layers that would be expected in the subsurface. We have the Lemont formation. Remember, that was the layer that was laid down by the glacier that came only partway across the site. The Tiskilwa formation. And then these gray layers here are bedrock formation. And there were three major bedrock units that I expected to encounter, the Silurian, the Maquoketa and the Galena formations. Now, the boring program was done after that and I could define this general depiction of the cross section into one specific to the conditions below the site. And the slide now shows what the geologic conditions are below the site based on the boring program. A couple things to note. We see the Lemont formation, that youngest glacial layer that was laid down and if you notice the extent of the Lemont formation it only comes partway across the site. So we see the Lemont formation stopping because the glacier stopped at this point and so it's only in this -- in this eastern portion of the site. We also have the Tiskilwa formation shown in this darker yellow color and that was the glacier advance that went all the way across the site, so we find it across the entire site area. There was also an older glacial till and on here it's just labeled as glacial till. It was a till that was laid down prior to that 25,000 years. It was from a previous glacial advance and so it was older than these two younger formations. These older glacial units are sometimes found and sometimes they're eroded by the glacier -- the younger glaciers, but we do have an older glacial till below the site. And till just means a mixture of different materials deposited out of the glacier. Now, on the bedrock you'll notice if you look at the gray layers that, again, we see the slope in the bedrock across the site area. So that bedrock is higher in the east area and the top of it goes down as you move into the west area. And so the thickness of the units above the bedrock change depending on which side of the site you're on. Now, we can look -- we can superimpose the proposed base grade on top of the geologic units and that's shown by this black line here and you see that it's -- on the east side it's situated primarily in the Tiskilwa till.

Now, we can look at the same cross section in one of the north/south cross sections so I have an N that I will show you and again, it just shows you that cut into the subsurface and the conditions that were found beneath the site. Here we have the Lemont formation, the Tiskilwa, the glacial till and then the uppermost bedrock, the Silurian. If we could go back one slide, I forgot to mention something. One more. I forgot to talk about the Henry formation on here and this Lacustrine unit. The Henry formation is a courser grain formation that's laid down from water moving and it's primarily found in valleys because as recent water and glacial water moved and melted away from the glaciers it went downstream valleys and deposited the courser deposits. So along the area of union ditch you find deposits in the Henry formation. You can see that they're thicker in the area of union ditch and that's why the sand and gravel pits were developed in that area. It's not an extensive deposit in this kind of thickness across this site because this was laid down in those valley areas. There is some small amount of Henry formation that's found in discontinuous pieces between the Lemont and the Tiskilwa till. Now, it was laid down differently than the Henry formation over near union ditch, but the way geologists name it still gets the same name. As the glacier advances and retreats there's water that melts off and it lays down these intermediate layers between the major units. There's also a similar unit called the Lacustrine unit and this is the first extensive unit beneath the site that's fairly continuous and again, was laid down by moving water that occurred as the glacier melts and a lake develops out in front of the glacier. So we do see some intermediate layers between the major deposits laid down from the actual glacier itself.

So if we move forward back to the north/south cross section we see the same units again. Here's the Silurian dolomite, the glacial -- the old glacial till, the Tiskilwa, some Henry, that disappears over where this boring was and then the Lemont.

If we overlay the proposed base grade you can see how that will be situated within those different geologic layers. In some areas the base grade will have some small amount of Henry formation underneath it and in those areas what is proposed is that this Henry formation will be overexcavated and replaced with structural fill.

Q. Ms. Underwood, you also characterized the hydrogeology at the site, correct?

A. Yes.

Q. What steps did you take in characterizing the hydrogeology?

A. As was the geology, you want to look at a lot of different pieces of information to be able to understand how groundwater moves through those different units. So you start with looking at the topography of the area. You look at the geology because that controls mainly groundwater movement. You want to look at the soil and rock characteristics which is what I did. I looked at the different water levels in all the different piezometers at the site. I looked at the groundwater chemistry. And then I looked at how groundwater flow systems are developed within those units.

Q. Now, based on this information could you now describe for us the hydrogeology at the site?

A. Yes. Just like I can go out in the field with some expectation of what the subsurface will look like, I do the same thing when I look at groundwater flow systems. Groundwater flow systems have characteristic patterns that they develop in just like the geologic units have characteristic ways that they are laid down. So for groundwater flow systems this is a depiction of how typical groundwater flow systems develop. And groundwater flow systems are divided generally into local, intermediate and regional flow systems. Local flow systems are flow systems that develop near the ground surface. They're very shallow. They're very much controlled by small changes in topography. And all groundwater flow systems are characterized with recharge areas which are areas where groundwater enters the flow system and discharge areas where groundwater exits the flow system. Discharge areas are usually around streams or lakes or things like that. So groundwater flow systems tend to be small in extent and shallow. Intermediate flow systems are developed on more regional topographic features. They go into the subsurface deeper. They're larger in extent so you're looking at thousands to miles for the size of these intermediate flow systems. And then regional flow systems would be much deeper and go for much greater distances into the tens and hundreds of miles typically.

Now, at the site we knew the geology and so we knew how groundwater moved generally through the different types of materials at the site. So the next picture depicts the different rock units beneath the site all the way down to the base of the deep sedimentary rocks. Now, I've only shown pictures of the rocks to about a hundred and fifty feet, but I'd like to just describe generally what the different aquifer and aquitard units are beneath the site to be able to tell people and show where people get their drinking water from. This picture is in the site application and it was developed by work that was done at the Illinois State Geological Survey. And the survey divided up all the different rock units and grouped them based on their different properties related to how groundwater moves through them. If we look at the uppermost unit, it's called the Prairie aquigroup, so we have an aquigroup which is the grouping of the different geologic units into a hydrologic grouping. Over on the left is just the geologic system name. Then we have the name of the different geologic units and whether they act as aquitards or aquifers and then a description of those different rock units. So the surface unit is called the Prairie aquigroup. And in the area of the site it's generally those glacial materials that are -- form barriers for the most part to groundwater movement. They're aquitards. Beneath that is the Silurian dolomite aquifer. Now, the Silurian dolomite in the area of the site is very limited in extent. There's just an erosional remnant and it doesn't -- isn't the first major aquifer that people get their drinking water out of, so it's not a significant or even used aquifer in this area. Beneath that is the Maquoketa confining unit. The Maquoketa is a shale layer and remember from the history from the ocean deposits Maquoketa shale would be formed from mud. So when it's turned into a rock layer, again, it doesn't allow water to move through it easily, so it's called a confining unit. Below that is the Galena-Platteville unit. Now, depending on the part of the state that you're in, sometimes it's used more for groundwater use and sometimes it's not. In this area the Galena-Platteville unit is what's used as the private water supply for most of the area. It's not a very good producing formation, but it does produce enough for private water supplies. Part of the reason it doesn't produce very much water is because it has this overlying Maquoketa unit above it. The main municipal drinking water source in the area is the Ancell aquifer and there's specific units within it, the St. Peter sandstone, that produce significant amounts of water. Just to give you an idea that the depth that these units are in, the Prairie aquigroup is about 50 feet in the area. The Silurian is very limited, zero to about 30 feet in the site area. The Maquoketa confining unit is about a hundred and twenty feet thick. The Galena-Platteville is 3 to 400 feet thick. And the Ancell aquifer I think is maybe about 400 feet. I don't remember quite exactly. Underneath the Ancell there's another confining unit and then there's another aquifer called the Ironton-Galesville aquifer. This is another one that produces a fair amount of water. As you get deeper then the production of those units goes down and you start encountering saline water and so those aren't used as much.

So again, the important thing is the Galena is the main drinking water source for private wells in the area and the underlying Ancell would be for more of the municipal wells.

Now, what I did was, again, with understanding how flow systems develop and understanding the different units, I could look at the groundwater beneath the site to look at how flow systems develop. And the next slide shows that. I have a slide that first shows how the regional systems develop and then the slide after this shows how the more local systems develop.

This is a regional cross section. You can see it shown where it's drawn in the legend at the bottom of the slide. So the cross section is drawn across DeKalb County and Kane County. So about a 40 -- about a 40-mile distance is what this picture is representing. We see the Prairie aquigroup shown in the brown. The Maquoketa shale shown in the darker gray. The Galena group in the light gray. And the Ancell aquifer beneath that. So this lighter gray material that represents the Galena would be the drinking water source.

You can also tell from this slide that, again, there's topography on the bedrock surface and then way over on the western edge of this cross section is located the Troy valley which is a big valley that was in the bedrock surface prior to the glacial materials being laid down.

The regional flow systems that develop in these deeper bedrock units -- and remember, regional systems are deep and they go for a large extent, follow the dip of the bedrock which is from west to east, so can you see a slope on that bedrock surface and the groundwater moves generally in that same direction toward the Fox River and pumping areas that are farther to the east of the site area. If we zoom in then more on the site area and look at the flow systems shallower in the subsurface we can draw a similar drawing. Here is the cross section located across the site and it's a little bit different orientation than my previous cross section. The reason for that is I try to draw this along a groundwater flow path, so it's slightly different. Things to look at on the key map is the location of Union Ditch No. 1 because that is important to the development of local flow systems. So if we look at the cross section there's a number of things pointed out. The area of the existing landfill, Union Ditch No. 1 here, the area of the east unit. Now, local flow systems again are controlled a lot by topography. And so if we look shallow we see these shallow flow systems that have developed in the Henry formation right around union ditch. Some intermediate system developed in the Silurian dolomite and that Lacustrine unit and these units flow from east to west. And then we get into the Galena group which is that light gray unit and you saw that in the previous slide and the flow in the Galena group goes in the opposite direction, so it goes from west to east. And so we understand the development of groundwater movement through the different units that are able to transmit groundwater.

The other way to look at understanding groundwater flow is to look at the same sort of depiction that I had in previously but in a planned view. So looking at it from looking down at the site essentially. So I constructed a series of groundwater flow maps which really just show what the different groundwater levels are in the subsurface for the different geologic units that transmit some water. So this, again, starting with the bedrock is the deepest -- deeper groundwater beneath the site. That's important to us in looking at conditions in the site area. This is the Galena group, it's the drinking water source of private wells in the area and what it shows is that groundwater moves from west to east in the Galena group. Now, overlying the Galena group the important units in terms of being able to monitor the site is the Silurian dolomite. And again, the Silurian dolomite, we just have a little erosional remnant, a little piece left over at the top of the bedrock surface. So the Galena is only found in the eastern area and it's depicted by this hatched line right here. So east of this line there's Silurian dolomite, west of it there is none. And groundwater flow in the Silurian dolomite has a component that goes towards the west and then goes toward the northeast. The Silurian dolomite is adjacent to the Lacustrine layer and the Lacustrine layer abuts against it or overlies it to some extent. So the last depiction of groundwater flow is in that Lacustrine unit. And where we have the Silurian bedrock high the Lacustrine isn't present, so the Lacustrine butts up against the Silurian. And then in all the area west of that and also some area to the east the Lacustrine layer exists and the flow in it is primarily from east to west. And those are the units. The Silurian and the Lacustrine are the first units that really can transmit enough water to be able to monitor and those are the ones that we developed a monitoring program in.

Q. So Ms. Underwood, what you have done is through your site-specific investigation characterized the various geologic units under the site, correct?

A. Yes.

Q. And those units, as you've described, include the Lemont formation on the east side, the Henry across parts of the west and the east side, the Tiskilwa till, the glacial till and the various bedrock units, correct?

A. That's correct.

Q. And then within those units you've been able to identify the presence of groundwater, correct?

A. Yes.

Q. And for those upper units the groundwater that you're referring to is not drinking water?

A. That's correct.

Q. The drinking water I believe you identified was in that deeper Galena group --

A. That's correct.

Q. -- correct? And the regulations I think, as you've alluded to, require that groundwater be monitorable or zones be identified as those that

need to be monitored, correct?
A. Yes.
Q. And what you've identified is the groundwater present in the Lacustrine unit and in the Silurian, correct?
A. That's correct.
Q. And the Lacustrine principally on the west unit or the disposal area west of union ditch and then the Lacustrine on a portion of the east unit and the Silurian on the east unit, correct?
A. Yes, that's correct.
Q. And the regulations would refer to those units -- those groundwater units as monitorable zones?
A. Yes.
Q. And those zones are what would be identified and required to be monitored as part of this proposed expansion, correct?
A. Yes.
Q. And you've also told us that within those units -- within the Lacustrine and the Silurian where we find groundwater, you've been able to identify the direction of flow within those units?
A. That's correct.

Q. And then on the basis of that information you can then develop and identify your groundwater monitoring system --

A. Yes.

Q. -- correct? That is the placement of those wells at appropriate points within those units?

A. Yes.

Q. And those groundwater monitoring wells are what comprise the groundwater monitoring system that you're proposing for this facility?

A. That's correct.

Q. And could you describe for us that groundwater monitoring system?

A. Yes. This slide depicts the proposed groundwater monitoring system for both the west and the east sides. If we start over on the west side many of these wells are existing wells. There are some additional wells over on the south side. These are located in the Henry formation, because remember, along union ditch there's some Henry material that occurs along union ditch, so we have some Henry formation wells here. And then the primary monitoring system is in the Lacustrine unit and because the

Lacustrine groundwater moves from east to west we have a series of wells that are placed along the west boundary of the landfill to be able to detect anything that would come from the west area. There's one well that's located on the north. There's not more wells on the north because, again, because the movement is east to west this is the direction. There isn't a component of flow that goes northward. So that's the series of wells that are proposed along the west unit. On the east unit we see a similar kind of monitoring -- monitoring well spacing that's been developed. A couple other things to point out on the west unit, at a number -- at many of these locations there's two wells located at each of these blue dots. So where we have both the Silurian unit and the Lacustrine unit we are proposing to put wells in both of those units. So in some places the Lacustrine is laying on top of the Silurian and we propose to put wells in both of those units. Where we only have one or the other unit there would only be one well. The direction, if you remember, from the Silurian dolomite was to the west and to the northeast, so you see the primary number of wells along the north and the west. And then there was a component of flow to the east, so you see the wells to the east. Now, there's three -- four wells located south of the east area and these are used as background monitoring wells. So we sample these wells as groundwater moves onto the property and then look at the groundwater quality there so that as groundwater exits the landfill area we can compare it to what's coming onto the site versus what goes away from the site. And so that monitoring program is developed to have conditions and information available to be able to look at any potential changes in groundwater quality. We can look at that same thing again in the cross-sectional view just to remind people what this looks like if you look at it in the subsurface. And the next slide shows that. So again, what we're monitoring is this upper Silurian unit and this Lacustrine unit here because it's the first continuous unit beneath the site near the base grade and the one that would potentially -- if -- would intercept anything should there be any performance issues with the landfill.

Q. So Ms. Underwood, the groundwater that you're monitoring here, as you indicated, is not the drinking water supply, correct?

A. That's correct.

Q. In fact, these units are located well above the drinking water supply which is what you've identified as the Galena here?

A. That's correct.

Q. And why is it important to be monitoring that level of groundwater as opposed to the drinking water?

A. It's important to monitor this level because should there be an issue we have time to react to it and this is the preferred movement. Water wants to follow the path of least resistance. The Lacustrine unit transmits water easier than these over and underlying units or the Maquoketa group, so we want to monitor those units where that shallowest groundwater moves.

Q. Now, Ms. Underwood, based upon your experience and your review of this data do you have an opinion as to whether the DeKalb County landfill expansion is located so as to protect the public health, safety and welfare?

A. Yes, I do.

Q. And what is your opinion?

A. I believe it is so located to do that.

Q. And what are the reasons for your opinion?

A. The first one, we have the ability to monitor the site. We can monitor the performance of the landfill. And then secondarily we have the ability to provide the information for the design of the landfill based on the different geologic materials below the site.

Q. Now, Ms. Underwood, I'd like to turn to Criteria 9 which asks whether the proposed expansion is located within a regulated recharge area. Is the expansion located within such an area?

A. No, it's not.

Q. And what's the basis on which you have drawn that conclusion?

A. There's only one regulated recharge area in the state located near Peoria.

MR. MORAN: Thank you, Ms. Underwood. I have no further questions, Mr. McCarthy.

HEARING OFFICER MCCARTHY: Thank you, Mr. Moran.

Why don't we take a break. It's about a quarter to 11 and we'll start with cross by Mr. McIntyre.

(A recess was taken at 10:47 a.m. and proceedings resumed at 11:10 a.m.)

HEARING OFFICER MCCARTHY: Okay. Let's continue with the public hearing. Mr. Moran completed his direct examination of this witness.

Mr. McIntyre, do you have any questions?

MR. MCINTYRE: Yes I do.

CROSS-EXAMINATION

BY MR. MCINTYRE:

Q. Good morning, Ms. Underwood.

A. Good morning.

Q. I have some earth-shattering questions to ask of you. We will talk about the effects of the recent earthquake. Has there been any testing done to verify that the geology has not changed or verified that underground conditions have not changed?

A. From what? I guess I --

Q. From the -- after the earthquake.

A. The conditions would not have changed.

Q. And that's based on --

A. The size of the earthquake, the location of the earthquake, the materials that we have at the site.

Q. Does the ground underneath shake during an earthquake?

A. Yes, that's what an earthquake is.

Q. What was the amount of shaking at the site?

A. I -- I think the size of it was four point -- I don't remember the exact number now.

Q. I think it was 3.8?

A. Yeah. I don't have -- I don't have the amount of movement at the site.

Q. So you are -- you are guaranteeing that the tight clay didn't form any cracks in response to the shaking?

A. I don't believe that there would be any cracks in the clay from the shaking, that's correct.

Q. But you wouldn't guarantee that?

A. The earthquake would not cause a cracking of the clay material because of the moisture

content and the water content of that. That's
not how clays develop cracks in them.
Q. It can crack concrete streets and not clay. If
-- in obviously what you feel is a very unlikely
scenario to say the least, if cracks did -- or
fractures occurred would that be a -- become a
preferred pathway for contaminant migration?
A. The clays won't -- don't break like that.
They're a plastic kind of material, so concrete
breaks because it's brittle and the clays aren't
brittle.
Q. The question I asked was if the cracks did
occur -- and let's extend that to any of the
material -- underground material that's there.
If any -- if any cracks occur does that then
become a preferred pathway for contaminant
migration?
A. Typically if you would see -- say the fault is
in the area in the bedrock, those -- when you
have movement you grind up the rock along the
fault zone, it's called a gouge zone and that
becomes a low-permeability area.
Q. So forgive me because everything you just said
went right over my head. Does a crack -- does

water follow a crack?

A. Yes.

Q. Okay. The Henry formation is all sand and gravel, correct?

A. It's got -- it's sand and gravel with other areas that are finer materials, clays and silts. It's got a combination, but it's a courser material in general.

Q. Is the Loogatrine (phonetic) a lot of sand and gravel?

A. I'm sorry. I couldn't hear --

Q. Is the Loogatrine -- Lacustrine, Lacustrine, I forgot the S. Is there a lot of sand and gravel in the Lacustrine layer?

A. Yes, the Lacustrine has a higher sand content, that's why it's the preferred pathway.

Q. And how much sand is in the Tiskilwa section related to the landfill location?

A. I'd have to look at the laboratory results. There is some sand. And till is a mixture of sand and clay and silt and what happens is the sand content is a small part of it and actually you end up filling in spaces between sand particles by the smaller particles so that, just

like concrete, you have sand inside the lime, that makes a very tight material because of the different grain sizes. So just the presence of sand doesn't say anything about how water moves through it.
Q.   Is sand more permeable than clay?
A.   If you have a clean, well-sorted sand, yes. If you have mixtures, it depends.
Q.   Is the material surrounding and underneath the union ditch -- is that highly permeable?
A.   That's a higher permeability material, yes.
Q.   What is a minor recharge system?
A.   I would say that's a recharge where there's very little recharge occurring.
Q.   Is there any such recharge system -- minor recharge system on or near the landfill expansion site?
A.   In the clay soils in the area you would have small amounts of infiltration. Most of that infiltration is taken back up out of the subsurface due to evapotranspiration, but that would be considered a minor recharge area.
Q.   And you're saying that the groundwater flow primarily is to the west and to the north?

A. It depends which unit.

Q. On the -- well, let's take each unit. On the west unit that -- the flow is to the primarily west and north?

A. In the Lacustrine unit in the west area flow is primarily west.

Q. Okay, and in the eastern unit?

A. And in the eastern unit the Silurian dolomite and the Lacustrine unit primarily are to the west. There is some component in the Silurian to the north/northeast and there's a component in the Lacustrine.

Q. Is there any areas that you found where there is impact to groundwater?

A. There are some impacts in the Henry formation because of the old site, right in the area of the old site.

Q. And that would be to the west of the union ditch?

A. It would be west of union ditch and south/southeast of the old fill area.

Q. So there's -- is there impact to groundwater to the east of the union ditch?

A. No.

Q. But there is southeast of the -- of the old site?

A. Between the old site and union ditch.

Q. How would the water flow east then?

THE WITNESS: Bruce, can you please put up the local flow -- local flow system slide.

At union ditch here's this local flow system that has developed, so you have a component of flow where if you're west of the ditch it moves toward the ditch. And if you're on the east side of union ditch then it moves westward toward the ditch, so the shallow groundwater in the Henry formation is going to flow towards the ditch is the easiest way to think about it.

Q. And there's no contamination to the east of the union ditch at all?

A. No.

Q. Could you explain what a groundwater impact assessment is?

A. Yes. A groundwater impact assessment is a groundwater calculation that has to be completed as part of the permitting process that looks at a hypothetical situation with the landfill and looks at impacts -- potential impacts to groundwater.

Q. Is there a groundwater impact assessment for this proposal?

A. There would be one at the permitting stage.

Q. Have you done this for Waste Management before -- this type of work?

A. I've done hydrogeologic characterizations for Waste Management, yes, and permitting for them, yes.

Q. Do you have any role in the groundwater impact assessment?

A. Yes, I've done those before.

Q. In the last 12 years and during the siting application have you ever had a groundwater impact assessment done?

A. Yes, I've completed some groundwater impact assessments.

Q. At the siting application?

A. Yes.

Q. Then why not now?

MR. MORAN: Objection, relevance.

HEARING OFFICER MCCARTHY: Overruled.

A. It wasn't a requirement and I had the last groundwater impact assessment that was done for the site that I reviewed when I looked at information from this site for this site.

Q. Isn't another purpose for a groundwater impact assessment to build confidence in the overall analysis?

A. No. It's a hypothetical calculation.

Q. So the Illinois EPA is wrong to require -- it is unnecessary then?

A. It's a requirement of the permitting process. It's necessary because it's part of the law.

Q. How many groundwater impact assessments have you done for Waste Management?

A. Dozens of them. I don't know how many.

Q. Dozens. And of those how many of them did you decide not to do until after the siting application?

A. I don't know.

Q. Any?

A. Yes, there's been sitings where I've not done groundwater impact assessments.

Q. Could you give me the name of that project?

A. I'm not positive which ones. I'd have to go back and try to figure it out. I don't remember.

Q. Well, would you say that you more often do it or not?

A. It just depends. It's not a critical -- it's not needed for the analysis that I did. I'm confident based on looking at the previous groundwater impact assessment and based on the design that it's not necessary to do at this point.

Q. But it is required for a permit?

A. Yes, we have to do it for a permit.

Q. Could you explain what a groundwater management zone is?

A. Yes. A groundwater management zone is set up at impacts at the site to define the area that needs to be monitored in looking at conditions at the site over time.

Q. And do we have any illustration in your presentation of where the groundwater management zones are on the site?

A. No.

Q. Why wouldn't we have that?

A. It wasn't necessary as part of the analysis. I understand that there's groundwater management zones at the site, but it doesn't change any of the information that I looked at or needed to look at to make my analysis and I did look at that information.

Q. So they could indicate contamination, correct?

A. It's defined by areas of impact, yes.

Q. And you don't think that that's important -- that that's not necessary for -- to understand where the contaminant areas are?

A. I do understand that. I did look at that. I just don't have a picture that shows that, but I looked at all of that information when I reviewed the site information.

Q. Is there a groundwater management zone for the old fill area as shown on both sides of union ditch?

A. Yes, there is.

Q. But I thought there was no contamination on the east side of union ditch?

A. That's correct. During the initial assessment of the old fill area there was I think one or two samples very near union ditch on the east side that had a low level I think of one constituent in one sample and two constituents in another sample. The well that's set up on the east side of the union ditch does not show any contamination now. So I suspect that that first sampling that was done -- union ditch has been straightened, there's been materials -- because of the burning activities there's probably a little bit of material that made it onto the east side of union ditch that was picked up, but there's been no continuing evidence that there is anything on that side of the ditch now.

Q. Would that be evidence of perhaps some flooding on the site?

A. Yeah, there could have been something that caused that especially during the time when -- again, the burning, that would transport some of the sediment or just the drudging of union ditch.

Q. There was a diagram. I don't think I need it though for this. The union ditch is the primary feeder for the east branch of the Kishwaukee River; is that correct?

A. Yes, that's one of the feeders, yes.

Q. And the east branch of the Kishwaukee River for those who haven't been here or pay that much attention to the river flow, that's the one that flows through Sycamore?

A. I don't remember exactly the path.

Q. Is there any way we can get a regional map? I don't know who this Bruce is, but he's pretty good.

A. Here's union ditch coming up here and here's going up toward Sycamore, so I'm assuming that's what you're talking about.

Q. Yes. Yes. So that goes through Sycamore?

A. Yes.

Q. Does that go through Genoa? No, I don't think it does. Is there a map that's a little more detailed? I mean, probably to be more accurate, a little less detailed. I don't think that goes through Genoa, does it?

MR. HAINES: The Kishwaukee does.

MR. ANDERSEN: The Kish does.

MR. MCINTYRE: At the east branch?

MR. ANDERSEN: The east branch jumps into the branch that comes out of DeKalb out north and west of Sycamore by the Sportsman Park area.

MR. MCINTYRE: Okay. Thank you, Ken

Andersen, Kishwaukee River expert.

MR. ANDERSEN: Well, I've just lived here a long time. That's all.

MR. MCINTYRE: We know that the -- that the old area is leaking?

A. There has been impacts from the old area more from waste being placed directly on the soil materials than I would say it's leaking, because it doesn't really have a containment system.

Q. And what containment system then does the north area have?

A. It would have a liner. It would have all the engineered design systems, a liner, cover, gas extraction.

Q. Is there a liner there now or is it clay?

A. I believe it's a clay liner.

Q. Is there any leaking in the north area?

A. No.

Q. Is there a groundwater management zone associated with the north area?

A. There is a groundwater management zone on the east side kind of towards the south that was placed there because of some gas impacts.

Q. Some gas impacts?

A. Yes.
Q. So there was some kind of gas leak or something on the north area?
A. No. From -- it would be from the old area, but it moved toward the east.
Q. Is it common to have an intact in situ -- did I pronounce that right -- clay liner adjacent to a sand and gravel --
A. An intact in situ liner?
Q. Yes.
A. It's not an in situ liner. It would be a recompacted clay liner and yeah, that's -- that's an acceptable liner system.
Q. And now, one of the ways to extract the -- the leachate was planting of trees. Are you familiar with that?
A. Yes. That's called phytoremediation.
Q. How does that remove contaminants?
A. There's a number of different ways that that can remove contaminants. One is it can help degrade the contaminants in the root zone of the tree system. It can physically remove the groundwater and then it will break down those contaminants in the vascular system of the trees

through enzymes that are in that material or it could actually volatilize the material, so -- there's more than that, I mean, but those are the three main ones that occur.

Q. How long has this -- this system been used?

A. I think it was placed in the late '90s. I don't remember the exact date.

Q. And do you know if any testing has been done that took place where it was put in the late '90s to see the effect on this?

A. There's a monitoring system that is in place for the remedial action and that's monitored on a quarterly basis and so there's monitoring that occurs all the time and it shows that the phytoremediation along with the gas trench is effective at controlling the contamination.

Q. Do these Poplar trees remove heavy metals?

A. There -- they were placed -- it wasn't a heavy metal issue and I don't remember -- metals will not break down the same way as the organic constituents. Petroleum products, that's what was remediated, so it's not a heavy metal problem.

Q. But will they remove heavy metals?

A. Yeah, I think phytoremediation is sometimes used for metals.
Q. How many times have you been out to the landfill?
A. Three.
Q. And do you know when you -- when those times were?
A. Just periodically during the project.
Q. Did you -- did you notice a gas smell?
A. No.
Q. I'm sure Mr. Campbell has lots more questions regarding the gas, but in your testimony you held up a magazine and said that actually there's a benefit to breathing the H2S?
A. There is an article in this month's Scientific American that talks about the benefits of hydrogen sulfide in the body, that it produces it naturally and that they're looking at it to develop both pharmaceuticals and ways to treat things such as cardiovascular disease and things like that.
Q. And you said that a very high level, I think 500 parts per million, was deadly?
A. Yes, and the trigger level that OSHA sets is a

hundred parts per million.

Q. Okay, so would you say then up to -- up to a hundred is beneficial?

A. No.

Q. Would you say that under a hundred for an extended period of time is helpful or harmful?

A. There are standards that are set for what the permissible amount is to breathe and the standards that are set are ten parts per million over a time-weighted average meaning over an 8-hour day with a maximum of 20 or 50 for a onetime period of ten minutes. So there are standards that are set that look at those levels, but the average is ten -- is ten parts per million over an 8-hour day.

Q. And again, my question was is that harmful over a period of time?

A. Yes, it's a concern. That's why the levels are set at more than ten parts per million over eight hours.

Q. What are the concerns?

A. There's various things. It's an irritant, it affects lung tissue, so it becomes toxic as you get to higher levels.

Q. Okay. I'll move away from that for now, but can we get the -- the boring locations diagram. Why -- well, do boring soil samples -- does that reveal contamination?

A. No, no.

Q. Okay. Could you explain then -- I thought maybe that's why there is no boring samples for the old site. Why are there no boring samples for the existing site? Obviously that's also -- everything but the active zone.

A. It would be bad practice to drill borings through the landfill to get at the soils underneath to be able to look at them. It would drill a hole through the -- through the liner system.

Q. Good point. That's why I ask these questions.

Can we get the cross section or NN? Now, I'm looking at the Henry section. This is for the -- the -- the west portion of the -- the west phase -- western phase of the landfill, correct?

A. This is on the eastern phase.

Q. This is on the eastern phase. Well, that all the sudden disappeared. It looks like the Henry

-- this is on the eastern section and then we'll go to the western, but it looks like the Henry is -- is contiguous, it's uninterrupted?

A. The Henry is not a continuous unit and the boring logs aren't shown on here, but this is one location where it's not continuous. By convention these lines are drawn between boring logs so there would have been a boring here and there would have been a boring here. At this location the Henry isn't there. And there's a number of locations like that across the site where the Henry is not present.

Q. But there's a little bit of it on the west side, right? Is there a cross section for the west end?

A. The Henry on the west side is really confined to that union ditch area.

Q. Okay, but I see a thin line of yellow going over to the west side and I believe in your testimony you were going to possibly remove the Henry that's under the west?

A. Yes. If the base grade does not go completely through the Henry it would excavate any Henry that was below the liner and then fill that area in with structural fill and then the liner would be built.

Q. Okay, so -- but the Henry is highly permeable, correct?

A. It's more permeable, yes.

Q. And the Henry is where the union ditch -- the -- the farthest area of the Henry on that diagram is where the union ditch is?

A. Where the Henry is thicker, yes, it occurs along union ditch.

MR. MCINTYRE: Okay. I have no further questions.

HEARING OFFICER MCCARTHY: Okay. Mr. Campbell?

MR. CAMPBELL: Thank you, sir.

CROSS-EXAMINATION

BY MR. CAMPBELL:

Q. Good afternoon, ma'am.

A. Good morning.

Q. Ma'am, during Mr. Moran's direct examination you made reference, I think toward the end of your testimony -- you were talking about all these different wells that have been drilled around this site and I think you said that these wells would disclose performance issues with the landfill if they were to arise. Is that a fair statement as to what you said?

A. Yes. The monitoring system is designed to be able to detect any performance issues with the landfill.

Q. Describe for me what you mean by a performance issue with the landfill?

A. If there would be a groundwater impact from the landfill.

Q. So if -- in lay language, if a substance from the landfill got into the groundwater this system is designed to detect that?

A. Yes.

Q. Okay, and you're trying to detect these performance issues why?

A. To check the performance of the landfill design.

Q. Would it be fair to say that you're trying to figure out -- you're trying to get notification if there's anything in that groundwater that shouldn't be in there; is that correct?

A. Yeah.

Q. Okay. Obviously if something gets in the groundwater that shouldn't be in there, that's an issue?

A. Yes.

Q. Could you explain to me why that's an issue? I mean, what are we ultimately trying to detect here?

A. The monitoring system is designed to check the performance of the landfill. So if there would be some release -- hypothetical release from the landfill that got into groundwater the system is designed to pick up the presence of that release.

Q. In your experience -- I think you said you've been doing this quite a few years. In landfills that you've worked on have there been performance issues with those landfills?

A. On a design like this, no.

Q. Based on your experience what sorts of substances might get into this -- in these wells that would be detected? In other words, what is this -- you know, these detection systems that are in these wells, what are they designed to pick up?

A. There's a specified list of parameters specified by IEPA. There's about a hundred and, I don't know, thirty or fifty. I don't remember the exact number of parameters.

Q. Mr. McIntyre has been nice enough to give me apparently the parameters, so for instance, ammonia, arsenic, boron, cadmium, chloride, those sorts of things this system is designed to pick up if that substance was to show up in the wells?

A. There's a -- yes, a whole series of compound classes that it's designed to pick up.

Q. Tell me what happens exactly when one of those systems in the wells detects one of these substances?

A. Well, first of all, if there would be a detection it has to be confirmed. Based on just the straight methodology and the statistical methods that are used to look at the data there's false positives that occur, so first of all, it has to be confirmed that it was actually detected.

Q. And if I could be simplistic here for a minute. Does an alarm go off somewhere? Does a computer say there's an issue here? What -- the monitor

that's actually down in that well in the water, where does that monitor transmit the information to?
A. There is no monitor in the wells. The wells are physically sampled. So the wells must be purged. There's a methodology to evacuate the water from the well.
Q. I want to -- before you get to that, how long -- so somebody physically goes to each one of these wells that are on that map and they test that water?
A. There's pumps -- dedicated pumps that are installed on the wells and so somebody physically has to go and turn on that pump.
Q. And to bring that sample up --
A. The pump would pump it up.
Q. Okay, and how often is that done?
A. On a quarterly basis.
Q. So four times a year?
A. Yes.
Q. So somebody from Waste Management or somebody contracted by Waste Management physically goes to each one of those wells four times a year, activates the pump and brings up those samples

and has those tested?

A. Yes.

Q. And where do they go -- are these in a container? I mean, are these like test tubes as if it was a blood sample?

A. There's multiple containers and there's different kinds of containers because the containers are dependent on what it's being analyzed for and so there's a rigorous procedure, there's a procedure for recording the conditions in the field, for transferring the bottles, how they're shipped, what temperature they're kept at. There's a very detailed procedure that has to be followed.

Q. You gave some -- a little bit of testimony under Mr. McIntyre's questioning in regards to some constituents being found and again, I don't think I'm talking about water here, but some constituents being found on the east side of the union ditch near the Henry formation; is that correct?

A. Yes.

Q. Okay. Is that something that is similar to the testing that goes on in the wells -- in other words, in this instance were soil samples taken and the same sort of analysis done on those samples?

A. When those were taken they were taken with a field-sampling method, so it was not as rigorous as having the wells installed and having a more controlled environment. So it was done through an instrument called CPT, cone penetrometer test, that allows you to draw a sample and send that into the laboratory. So it's not -- it wouldn't be considered as high a quality. The chance for cross-contamination or outside contamination to affect it is higher.

Q. Is the difference in the quality of the testing the idea that we're testing water and we really want to make sure the water is clean? I mean, just in general is that why it's more rigorous --

A. It -- it --

Q. -- or more exacting?

A. Well, when you install a dedicated well with a dedicated pump, that will be more rigorous. The ones that showed the small hits over on the east side of union ditch was done with a less rigorous method.

Q. Okay. Were you actually involved in the testing or in that process when those constituents were uncovered?

A. Yes. I wasn't out in the field, but I would have reviewed the report.

Q. Okay. You weren't actually there at the time and notified there was something found in those samples, it was later on that you looked back and read the reports? I want to make sure I'm clear.

A. We would have shipped the samples off. It takes about four to six weeks to get the results back and then you look at the results and analyze it and that's when I would have looked at the data.

Q. And you indicated in your testimony -- I think you said there was one constituent found in one sample and one constituent found in another sample. Could you tell me what constituents were found in each sample?

A. I think it was benzene which is a petroleum-related component and I forget the second one. Probably another petroleum --

petroleum-related compound.

Q. And I think you said that it was your opinion that these -- this benzene and this other type of material had migrated across the ditch. I think you said that could have happened because of the flooding that had occurred or the burning that had occurred?

A. I suspect from the burning that there's a little bit of soil material or ash material or whatever or --

Q. So when it burned it went in the air and came down on the other side?

A. Or I know that union ditch has been dredged, so that would, you know, pick up soils from the west side and potentially move them to the east side. It's not a groundwater pathway.

Q. Okay. There's been a -- some testimony previously in regards to this -- the Henry portion of this landfill, that part of the landfill being contaminated, under remediation right now. Are you familiar with that?

A. Yes, that's what we were talking about.

Q. Okay, so the specific contamination that's contained in the Henry portion of the landfill, the specific contaminants, it's your testimony that's benzene and this other -- you think it's a petroleum-related substance?

A. Yeah, there's -- there's petroleum -- primarily petroleum-related constituents that have --

Q. In that portion of the landfill?

A. Yeah, uh-huh.

Q. You said you had been out to the site a few times. I think you said three. How close is that Henry portion of the landfill that's contaminated with the Union Ditch No. 1? Can you give me the approximate distance? And I'm not asking you for very specific, but if you can just roughly give me an idea how close that is.

A. You're looking at a hundred feet I believe.

Q. Is it a concern of yours at all, ma'am, as an expert in water that any of those contaminants could get into the water that's in the Union Ditch No. 1 and somehow find its way into the Kishwaukee River?

A. No. We periodically test union ditch and nothing has ever showed up in union ditch.

Q. You periodically test the water in union ditch?

A. Yes.

Q. And how often is that done?
A. I think that's a quarterly basis also.
Q. Is that the same process that was described before that samples are taken and sent off to the same sort of lab as the well testing?
A. Yeah.
Q. And it's your testimony, ma'am, that there's been no contaminants or constituents found in any of the tests that have been conducted on that water of the Union Ditch No. 1?
A. Right, there's no contamination that's been found in Union Ditch No. 1.
Q. Were you involved in the recommendation in regards to how to remediate the Henry contamination portion of the landfill?
A. I was a reviewer, but I wasn't the design engineer.
Q. Okay. I think Mr. McIntyre asked you or perhaps Mr. Moran that you understand that the Poplar trees were planted in that area to try to effectuate that remediation; is that correct?
A. Yes.
Q. Okay. In your experience and your expertise would it have been a safer remediation had we

just completely removed that contaminated portion of the landfill and moved it away from Union Ditch No. 1?

A. The concentrations of constituents are low and confined in a, you know, small area so that this was a safe way to do it.

Q. Okay. Would it have been safer though had we, you know, completely dug that contaminated portion out and moved it?

MR. MORAN: Objection, relevance and she's answered.

HEARING OFFICER MCCARTHY: Overruled.

A. If you take a source completely away, that's better.

Q. Okay.

A. But it wasn't necessary.

Q. Okay. If constituents migrated from the Henry portion of the landfill that's contaminated -- if some samples on the east side of the Union Ditch No. 1 indicated the presence of benzene and -- or some other petroleum-related compound is it possible, ma'am -- and I'm just asking you based on your expert opinion -- that any of that material could in the future migrate into that

water in Union Ditch No. One?
A. Again, that's -- that's tested. There's a well on the east side of Union Ditch No. 1 that doesn't show anything, so that's -- that doesn't happen.
Q. So it's not possible, is that what your testimony is?
A. There's nothing there, so it's not possible.
Q. Okay. Ms. Underwood, I want to ask you -- you gave quite a few opinions earlier in regards to H2S and I want to direct a series of questions in regards to that issue. You testified previously that you would go on this particular site -- and if I could back up a little bit. When were you first retained to work on this particular site?
A. Back in the 1990s was the first time I worked on this site, but not this siting application.
Q. So what was your -- if we could just chronologically take this. What was your involvement in the 1990s in regard to this site?
A. I would have helped with the permitting of the site.
Q. Initially?

A. Well, the permit -- I don't remember what stage of permitting it was, but during that time period.

Q. Providing the same sort of expertise you're providing now?

A. It would be for a permit application, not a siting application.

Q. In regards to this specific application when did you become involved?

A. I believe February of 2009.

Q. Okay, so about -- you've been working on this for about a year, about 13 months?

A. Yes.

Q. And I think it was your testimony that your involvement specifically was in regards to the geological and hydrogeological conditions at the proposed site; is that correct?

A. Yes.

Q. And your resume obviously has a very extensive breakdown of your expertise in this particular area; is that correct?

A. Yes.

Q. So just to make sure I'm clear, you weren't retained in this particular application to deal

with the air quality or the air issues in
regards to this landfill?
A. I was not retained for that.
Q. Okay. In fact, ma'am, would it be a fair statement that your background is not in the area of air quality or you know, air issues in regard to landfills?
A. It is to the extent that I need to work on landfills, I'm exposed to constituents on a daily basis working on sites all over the country and I need to be prepared to encounter those constituents whether it's for this landfill or any other one or any other type of remedial site.
Q. If we could go through your background here a little bit, ma'am. You indicated that you had a bachelor of science from the University of Wisconsin; is that correct?
A. Yes, at Oshkosh.
Q. And that's in geology?
A. Yes.
Q. And you have a master's of science in hydrology from the University of Idaho; is that correct?
A. Yes.

Q. Did you pursue a doctorate degree in any of these fields?

A. No.

Q. Could you tell me, ma'am, if you remember, what portions of either one of these two degrees dealt with the field of chemistry?

A. All of them -- both of them.

Q. All of them did?

A. I had to take chemistry classes.

Q. You would have taken qualitative analysis and quantitative analysis, the basic chemistry courses?

A. Yes.

Q. Could you tell us how many chemistry classes you've taken, ma'am?

A. I don't remember.

Q. You're not here today as a chemistry expert; is that a fair statement?

A. That's correct.

Q. Okay. You had some very specific opinions in regards to H2S and as I review your project -- major project experience -- and I understand this is a -- kind of a condensed form of your resume, could you tell me which one of these

projects you worked on that you specifically
dealt with H2S?

A. Every landfill project you would have to deal
with H2S from a health and safety standpoint.

Q. Have you previously testified in other hearings
-- application hearings in regards to H2S?

A. No.

Q. Ever?

A. No.

Q. How many times have you testified, ma'am,
approximately at application hearings?

A. 12 -- I don't really know the number, but ten
or twelve I would guess.

Q. Have you ever been called as a witness in
regards to H2S in any sort of experience in your
background?

A. Not H2S specifically. I've dealt with landfill
gas and I've dealt with vapor intrusion issues
related to contamination.

Q. Talk to me about vapor intrusion. Explain that
to me.

A. There can be constituents in the ground -- in
the air that's in the ground above the water
table, there's concerns if those move into

structures and I've worked on projects and have been the lead scientist on projects that deal with those types of issues.

Q. You're not a -- I think you already said this, ma'am, you're not a chemist, correct?

A. My degrees are not in chemistry, but I deal with chemical issues daily.

Q. You're not a biologist?

A. I'm not a biologist.

Q. You're not an air quality expert?

A. No.

Q. You gave some rather specific opinions in regards to the effects of H2S on humans. Would it be fair to say, ma'am, that that's not your area of expertise?

A. It's my area of expertise to the extent that I need to be safe when I go on these sites and I have to keep my employees or contractors safe on these sites if they're exposed to these kinds of constituents, so I do work with that on a daily basis on every site that I work on related to contamination.

Q. Could you describe for us what sort of background you've had in regards to training or education dealing with the effects of H2S on humans?

A. The experience that I would have on that is related to health and safety plans and being prepared in case that gas is present on the site.

Q. What specific educational background do you have in regards to that?

A. I've gone through HAZWOPER training it's called. I don't remember the exact acronym, but it's for investigations out on contaminated sites. That's a 40-hour course and there's refresher courses that are required for that. I also taught in the hazardous waste program -- hazardous materials handling program at Lakeshore Technical College and taught a course called Geology, Meteorology and Mapping that talked about issues related to constituents in air if you have hazardous material spills.

Q. Have you ever consulted with experts in the field of H2S in regards to your handling of these various sites?

A. Other health and safety officers or health and safety people in companies that I've worked for, yes.

Q. Would it be fair to say that if you were trying to get definitive answers on some of these issues in regards to H2S that you would consult somebody that's more qualified to render those opinions?

A. If I -- it depends. If I was -- wrote a health and safety plan that dealt with H2S issues, that would be reviewed by another health and safety person. There's specific publications that are put out that deal with health issues and the levels that are acceptable for exposure and I would consult those probably more than I would look at going to somebody else and look for the printed materials so I could have the exact numbers.

Q. Were you aware of the H2S problems that arose at this particular site back in 2008 and 2009?

A. No.

Q. Do you have any knowledge as you sit there today in regards to those particular issues?

A. Not -- I've heard what Dale Hoekstra testified to.

Q. And just to be very, very clear here, you weren't retained by Waste Management at this particular site to have anything to do with H2S, methane or any other trace gases released from the site, that's not what you were specifically hired to look into; is that correct?

A. That's correct.

Q. Okay. You've testified that you know about this area because you want to make sure your employees are safe and you obviously work on these sites. Have you ever specifically been involved in testing the air quality above or around these sites?

A. I don't go out and do air testing, no.

Q. So if we were to ask you about the air quality of this particular site or the air quality around this particular site you wouldn't be able to render an opinion on that; is that correct?

A. I don't have an opinion on that, that's correct.

Q. You talked about the fact that sites that you work on you're concerned about the safety of the people working there and obviously yourself. Would it make sense to review the data in regards to this particular site and I'm talking about the air quality if you were working on this particular site?

A. I know that Waste Management employees need to wear hydrogen sulfide detectors because their concern is greater than even my concern because they have employees out on the site on a daily basis. That information related to have they ever had problems with exceeding H2S levels by their employees would be what I would want to know about and there has not been any types of those exceedances with their employees. If their employees who are working right next to landfill gas wells are not exposed, then I would not be concerned about air quality in that landfill area.

Q. And you've reached that conclusion without reviewing any of the data regarding the air quality above or around this particular site?

A. Yes.

Q. You've -- I'm not sure how long you've been here, but you've heard discussions about the -- back in 2008 and 2009 some complaints coming in in regards to foul odors around the site; is that correct?

A. Yes.

Q. Okay, and you indicated that you worked on the site since February of 2009; is that correct?

A. Yes.

Q. Okay. Did you -- and I think Mr. McIntyre asked you when you went to the site that you -- you never smelled anything; is that correct?

A. Yes.

Q. Did it come to your attention last year that the H2S emission was something that -- that Waste Management was concerned about?

A. No.

Q. Were you aware of Mr. Hoekstra's involvement in trying to figure out how exactly that -- that H2S was emanating from the site?

A. No.

Q. So if I told you that he testified that Waste Management endeavored to determine the source of -- of that, you wouldn't know anything about that?

A. I heard his testimony.

Q. Okay, but last year in 2009 this was something you knew nothing about?

A. That's correct.

Q. Okay. Did you have conversations in 2009 with the people at the site or with Mr. Hoekstra in regards to the general operation of the site?

A. No.

Q. Nobody?

A. I reviewed the information related to groundwater and I guess I would have had conversations related to the remedial action -- the corrective action.

Q. So when you -- you said you had gone to the site you thought three times and you said that you're concerned when you go to these sites, you want to make sure that they're safe and it never dawned on you to ask anybody about any emissions from these particular sites -- for this particular site?

A. I wasn't going in an area where H2S would be of concern for me.

Q. So you were staying away from those areas?

A. The only areas that would potentially be a concern would be around gas wells or places where gas could collect which would be the working face generally of the landfill and I don't go into the working area of the landfill.

Outside of that area it would not be a concern.
Q. So if -- if I told you that people in the adjacent towns have smelled some of these odors, in your opinion as an expert working with Waste Management sites would that be a concern of yours as a professional?
A. No.
Q. Okay. Ma'am, do you have any experience in toxic gas remediation?
A. I'm not quite sure what that means.
Q. Well, Mr. Hoekstra described for us that H2S was detected coming from the site and he determined the source to be gypsum that was coming in from a company improperly. If I told you that a particular site had an H2S problem would you be able to give me any sort of opinion on how that problem might be remediated?
A. When H2S becomes a problem -- and again, it becomes a problem when you have -- I'll call it a bubble of the gas that can be released at a high enough concentration that it can kill people, just -- which is situations like waste water treatment plants, around manure areas, around a landfill. If there were areas where I

was going to be where that kind of gas release could occur and it was confined to an area that would not allow an area to be ventilated, then it would be a concern to me. If I'm outside of that type of area where there's -- where it's well ventilated, which is the first thing that rescue workers do is in a situation when H2S is a problem they come in and ventilate the area, it would not be a concern to me.

Q. You keep making reference to like dangerous levels of H2S. Would it be fair to say, ma'am, that it's not within your -- your area of expertise to really make judgments on what levels are safe and unsafe for human beings?

A. I rely on agencies like the Agency for Toxic -- let's see if I can remember the name --

MS. TOBIAS: ATSDR, Toxic Substances and Disease Registry.

MR. CAMPBELL: Thank you, Ms. Tobias, for that.

A. Yeah, who have done the studies, you know, and have epidemiologists and the people that look at that information and I rely on those public values.

Q. Is there anything in any of the documents that you filed in regards to the compilation of this application that deals with H2S?

A. No.

Q. You conveniently arrived with a magazine today talking about -- I think you're trying to talk about the benefits actually of H2S. When did you get that article and decide to bring it to the hearing?

A. Over the last two days it just came out.

Q. Was -- did you bring that article specifically because this issue became something that apparently was a concern to some of the citizens here in DeKalb County?

A. Yes.

Q. Okay, but you would clearly admit that you're not qualified to talk about the contents of that article except to the extent that you read it; would that be a fair statement?

MR. MORAN: Objection, it's calling for a legal conclusion.

HEARING OFFICER MCCARTHY: Sustained.

Q. Ma'am, you're not -- you don't have the qualifications necessary to render an opinion in regards to the beneficial effects of H2S?

MR. MORAN: Same objection.

HEARING OFFICER MCCARTHY: Do you want to rephrase that question, Mr. --

Q. Sure, sure. What was the purpose of making reference to the article in regards to H2S, ma'am?

A. To try to provide some information that put in perspective the concentrations of H2S that just simply because you have H2S doesn't mean you have any cause for worry. That H2S is a naturally-occurring compound. At certain levels, yes, it's a very serious and deadly gas, but there's -- at lower concentrations it is not a health concern and so the purpose of providing that article was to try to give some perspective on H2S.

Q. So again, you weren't necessarily giving your own personal opinion as an expert, you were -- you were transmitting some information or conveying some information that you had -- had found?

A. That's correct.

Q. Okay. Have you ever had any specific instances that you can refer to me where H2S was a problem on one of the sites that you worked on?

A. I don't know of any problems on any of the sites that I've worked on with H2S.

Q. And how many sites have you worked on, ma'am?

A. Upwards of 30 or 40 that are -- are landfill related.

Q. So if you've never had a problem that's arisen in any of the sites that you've dealt with would it be fair to say then that you haven't dealt with the remediation of any sites with an H2S problem -- would that be a fair statement?

A. Yeah, yes.

Q. So in regards to this particular site here, ma'am, I think at the conclusion of your testimony one of Mr. Moran's questions was in regards to one of the elements of this -- the statute and you testified that -- that this particular site was located to protect the health, safety and welfare of the DeKalb County residents that you didn't have a concern about that in regard to DeKalb County residents; is that correct?

A. That's correct.

Q. And you're making that statement, ma'am and you're giving -- you're giving The Court that opinion without having any knowledge of the H2S issue that came up in 2008 and 2009; is that correct?

A. I've listened to the testimony and based on the testimony that I heard I would not change my opinion.

Q. So prior to arriving here at this hearing I'm assuming you had already reached a conclusion that based on your involvement with this site that there wasn't a health, safety or welfare issue with regards to this particular site, is that correct? You had already reached that opinion and that opinion went into the application; is that correct?

A. Yes.

Q. In other words, here today you're talking about the conclusions that you've already reached?

A. Yes.

Q. Okay, and those conclusions that you reached before you came here to testify, none of that investigation that you did and none of those conclusions that you reached had anything to do with H2S; is that correct?

A. That's correct.

Q. In fact, I think you said H2S isn't even mentioned in any of the documents that you compiled and provided as a part of this application; is that correct?

A. In my portion, that's correct, yes.

Q. Any gases whatsoever?

A. I don't think so.

Q. Methane?

A. No.

Q. So ma'am, it's your testimony here under oath that your opinion in regards to the H2S issue is only based on the testimony that you've heard here during this hearing?

A. And based on my experience dealing with H2S, the presence or potential presence of H2S at landfill sites and other sites that I've worked on.

Q. Do you have any experience with gypsum?

A. Yes.

Q. What experience do you have with that, ma'am?

A. Well, my most recent experience was working on a gypsum -- an old gypsum pile near Laraway.

Q. At the time that you dealt with that pile was it known that gypsum might be the cause of the emission of H_2S?

A. There were other concerns related to gypsum other than H_2S with that --

Q. That wasn't my question. I said at the time that you worked on that was that a concern for air experts that H_2S might come from the storage in landfill sites of gypsum?

A. The way that the gypsum pile was stored and situated that was not a concern.

Q. Was it known though at the time that -- that gypsum actually produced the noxious gas of H_2S?

A. Well, it's a process -- yeah, I mean, that's how you get it in your groundwater, so people that have water wells that sometimes have a smell to them, it can be coming from some of the gypsum materials and their source -- there's a food source, that sulfur bacteria.

Q. And you indicated that none of the previous sites you worked on had an H_2S problem and you didn't have one on that gypsum pile?

A. No.

Q. Okay. Have you ever attended any educational

seminars, classes with OSHA or with EPA in regards to air quality?
A. Yes.
Q. Okay, and what class was that and when was that?
A. My hazardous materials training which would be that 40-hour course and refresher courses.
Q. How much of that 40-hour course dealt with air quality?
A. Well, it deals with all pathways for exposure, so air would be one, skin contact would be another, eating or drinking would be another. It would deal with all of those pathways all the way through the course.
Q. How many different subject matters were dealt with in that 40-hour course?
A. The range of constituents that you would expect to find and the potential exposure to those constituents.
Q. Would it be fair to say you don't remember how many -- I'm not trying to be cute here with you, I'm just curious.
A. I don't know how you define subject -- I mean, it dealt with constituents and potential

exposure to constituents.
Q. When was the last time you reviewed -- before this particular article that you bought today when was the last time you reviewed any sort of learned treatise or periodical or magazine article, whatever, in regard to H2S?
A. Probably the last time I got questions from people about the smell in their wells and -- I don't know, a couple of years ago.
Q. When people would ask you about the smell in their wells talk to me a little bit about how that relates to H2S?
A. There's three main issues that people often are concerned with with private wells -- that use the private wells for their drinking water source. One is hardness, one is iron in their wells and the third one is a smell to their water. The smell to their water typically comes from hydrogen sulfide and so it's a common thing that is dealt with. You look at where it's potentially coming from, it can be naturally in the ground in the rock materials especially in the types of materials like around here in that Maquoketa shale. It would not be unusual if you

had a well that went into the Maquoketa and most wells don't get water from the Maquoketa because it can't produce it, but it could produce hydrogen sulfide that gets in the well and people smell it and they want to know what to do about it.

Q. When you -- again, just to backtrack a little bit. The best way to know, you know, what exactly is in a particular sample of water is obviously to test it; is that correct?

A. Yes.

Q. And I think I got a laundry list of things that are looked for by those monitors that you indicated are in the wells or the samples that are taken out of the wells. When you had instances where people asked you about the particular smell, in other words, something in the air that's going into their nose did you have occasion on those instances to actually have that air tested?

A. No.

Q. Would it make sense as a -- I consider you a scientist. Would it make sense as a scientist just as if -- you know, if you're going to test water to find out what's in water, would it make sense also if you're going to find out what's in air to test air?

A. Yeah, depending on the situation you may test the air, yes.

Q. Have you ever tested air -- just in general in your professional career have you ever had an opportunity to actually conduct an analysis on air?

A. Yes. When we're out at sites depending on the site we may be continuously monitoring our breathing space, yes.

Q. And when you were out at the particular site that we're -- that's the subject matter of this hearing did you did any of that?

A. It was never a concern.

Q. But you didn't know that there was an H2S issue in 2008/2009?

A. It would not be a concern unless I had been down in the areas where the gas was being produced. In the general area around the landfill it would not be a concern. Even if I had known I would not be -- it would not be a concern.

Q. So you're saying it's not a concern, but you're also conceding that there was no analysis, to your knowledge, done by yourself to determine exactly what was in that air?
A. I'm not conceding. That's the way it was.
Q. Okay, but you didn't know truly what was in the air?
A. No, I didn't have a chemical analysis of the air.
Q. Correct. So if there was a grade school a half a mile away from this site, which there is, if there was a smell in the air there around the time that -- you know, 2008/2009 we would not know exactly what was in that air without testing that air; would that be a fair statement?
A. Yes.
Q. To your knowledge either what you personally did on this particular project or in any of the documents that you reviewed in preparation for your participation on this project did you become aware of any sort of air testing that was conducted around this particular site?
A. Just this talk about -- by Mr. Hoekstra.

Q. So if Mr. Hoekstra said that the air at the school had never been tested, it's your testimony that you would agree with him because you don't know anything different?
A. Yes.

MR. CAMPBELL: Okay. That's all I have, sir.

HEARING OFFICER MCCARTHY: Okay. Thank you. It's 12:25. Let's take our lunch break here and resume at 1:45.

(A recess was taken at 12:25 p.m. and proceedings resumed at 1:45 p.m.)

HEARING OFFICER MCCARTHY: Let's reconvene the public hearing.

We have heard from Mr. McIntyre and Mr. Campbell, and one of the committee members has to leave, Mr. Haines and so he's asked me if he could go next and ask his question or questions of the witness.

With that, Mr. Haines, do you want to go ahead.

MR. HAINES: Thank you, sir.

CROSS-EXAMINATION

BY MR. HAINES:

Q. I really just have one question, but it's probably the most important one for you from me. I think for me in making up my mind about this whole application the Criterion 2, the health and safety and welfare of our citizens is the most important criterion. And I think you have already spoken to it, but I just wanted to ask it again for the record. In your best professional judgment as a hydrogeologist, geologist that this application is safe for our citizens in the way it's described in terms of groundwater safety and all the other areas that you are qualified to comment on?

A. Yes, it's my opinion that that is safe.

MR. HAINES: Thank you.

HEARING OFFICER MCCARTHY: Okay. With that we'll go to Mr. Roger Steimel.

ROGER STEIMEL: Thank you.

CROSS-EXAMINATION

BY MR. R. STEIMEL:

Q. I'd like to visit the Poplar tree growth. Poplar trees are being used for remediation. What is the depth of the roots on the Poplar trees?

A. I don't know the exact depth of the root.

Q. Okay. What is the depth of the contamination at that old site?

A. It's based on the depth of the Henry formation. I'd have to look at cross sections to give you a number.

Q. You don't know how deep that is?

A. It's shallow.

Q. Can you give an indication? Is it 20 feet or --

A. Less than 20 feet, probably less than that even.

Q. Now, the Henry foundation (sic), you spoke about that earlier this morning, is sand and gravel, somewhat porous. How deep do you feel that that contamination has gone?

A. It doesn't want to go deep because of the way those flow systems develop. So because it's right near the ditch and it's at the ground surface it wants to stay porous to ground surface.

In addition, one of the functions of the Poplar trees is to take water out of the system.

So Poplar trees are good because they use a lot of water, and that's one of the reasons that they're chosen as one of the trees that are planted. So what that does is help depress the water table because it's drawing water out, and so water wants to go to that Poplar tree area and not past it. So there's a secondary function besides treating the material, it also controls groundwater flow.

Q.   So how deep do you expect the process will go to remove that contamination? Do you have any recommendation on that?

A.   It would -- from a hydrologic standpoint, it would affect all the way through that Henry formation.

Q.   Okay, and the Henry formation at that location, how deep would that be? Have you taken a boring there?

A.   It's -- hang on and I'll look.

Q.   See, I'd love to get rid of those Poplar trees because the beaver love them, then they fall over into the ditch.

A.   It's 15 feet above.

Q.   The bottom of the level of the --

A.   Yeah.

Q.   15 feet?

A.   Yes.

Q.   Okay. I'd like to move to the area of the private wells. Are you familiar with the layout of the private wells within a mile and a half -- or a half mile of the -- have you worked with that?

A.   Generally, yes.

Q.   Okay. Are you familiar with the testing that's done with the private wells? Do you see those tests?

A.   I don't know.

Q.   They're done on an annual basis.

A.   I'm not aware of testing done on private wells except as people would do it themselves.

Q.   Waste Management does test all the private wells annually that are in the half-mile radius. And I was wondering if a test for hydrogen sulfide is included in that testing, do you know?

A.   It would not be typically part of a groundwater suite of things to look for, and it would be an unreliable test to relate to the landfill because of the natural presence of hydrogen sulfide in groundwater systems.

Q. Okay. When you were giving what I thought was an excellent presentation this morning, but for my purposes we didn't have the elevation or a depth as we moved down through the formations, so could you just review with me again the different formations as we move down from the base of the landfill down to where these private wells would be, for instance, if you have a well 200 feet deep?

A. A well that would be 200 feet deep is going to be in this formation, in the Galena. This Maquoketa unit is about 120 or 130 feet thick. This has a maximum thickness at the site I think of about 40 -- 30 some feet, 30 odd feet it is. And then this is about 20 to 30 feet in this area. So to get down here you're talking about 120, 160 -- 200 feet above.

Q. 200 feet. Is it possible at all for groundwater to get down to the Galena layer in that location?

A. Water that would be from this area would not move downward this way into the Galena. First of all, I would get into the Lacustrine unit and the Silurian unit. The flow of those units want to take it horizontal. So this actually acts as a way to, uhm, prevent downward movement and a way to intercept water from this layer, because this is a more preferred pathway. So it's not a direct downward flow.

Q. Okay. On the private wells, if there would be some contamination occur what would be the procedure determining if Waste Management's landfill might be the reason for that?

A. There's a number of things that you would want to look at from the analysis of the groundwater sample from a well. One of the things is to look at a certain class of compounds called inorganic compounds. Those are the minerals that generally show up in groundwater just because it's in contact with rock. So you can look at differences in the makeup of those inorganic compounds between wells and between different groundwater areas. So that's one thing to look at.

You would want to look at the specific compounds that might be detected. And leachate contains many different compounds, and so it's unusual to see one -- it would be very, very unusual to see just one compound if there was impact from leachate showing up in a well. So you would want to see what type of compounds showed up, and then you would want to compare that back to conditions that you see in the landfill to see if there's a correlation between those constituents and what you see at the landfill.

You'd also want to look at where it is in the groundwater flow system to see is there a pathway even. Many times the wells become contaminated because the surface casing or the casing becomes weathered over time or breaks up over time and you'll get leakage around well casings. That's the most common way for wells to become contaminated with something. So you would want to look at the conditions of the wells.

So those are just a few things that if I was asked to review something like that, things that I would start looking at.

Q. Okay. Are you familiar with the reports that are taken from the monitoring wells, the water wells around the landfill?

A. I have not looked at the water well reports. I have looked at all the monitoring well information from the site.

Q. Okay, and as far as you know there's been no contamination that is shown from those monitoring wells?

A. The only contamination that showed up is that area right there in the old site.

Q. Okay. I'd like to just move on to one other area. How many residents are existing now on the east site of the proposed landfill? Are you familiar with that?

A. I don't know the exact number of residents that are there.

Q. You don't know how many wells there are now there, private wells?

A. There's a map that shows the location -- the general location of the private wells, and shown during Andy's presentation.

Q. Would you review the procedure that would be taken to close those wells?

A. Sure. Decommissioning private wells --

Q. Yes.

A. -- would have to follow a regulation and has to be documented. But typically they would be filled with a cement or cement bentonite grout, and that would be filled in from the bottom of the well upward. And then the casing -- the surface casings sometimes are drawn or cut off, and then there's a little bit of topsoil or, you know, soil material placed on top of that area so it would be -- grow grass or whatever needed to grow there.

Q. The wells that would be located in this area, how far below the base of the landfill would those be lowered to?

A. The private wells would not need to be lowered.

Q. The -- if you're -- the landfill is being -- the cells are going down 30 feet, 40 feet in the ground there would have to be a private well in that specific area. Would you remove the well there or would you -- you wouldn't let that well come up through your landfill?

A. If there is a well within the landfill equipment that would need to be abandoned, yes. It would be decommissioned, the hole would be filled in with material that was not permeable, that would not let water transfer through it.

Q. I guess my question is would that be done below the base of the landfill?

A. Absolutely.

Q. 5 feet, 10 feet?

A. It would fill in the entire well that would be below the base of the landfill. You wouldn't leave any space, any conduit there.

Q. Okay, I guess I understand that.

That's the only questions I have.

HEARING OFFICER MCCARTHY: Okay. Mr. Dan Steimel.

CROSS-EXAMINATION

BY MR. D. STEIMEL:

Q. Good afternoon. I just have a couple questions for you. Back when that picture of the Galena aquifer, you said that is the region that most of the local wells get their water from?

A. Yes.

Q. And on that picture on the west -- it looked like the west side of the landfill area that was the -- where the Galena aquifer is -- that's the shallowest point?

A. Yes, there's a slight dip to the bedrock layers, so the Galena would be a little higher on the west side than on the east side.

Q. So what is the depth of the top of that Galena level?

A. It's about a hundred feet, 80 -- I think it's about 90 feet. I have to go back and look again.

Q. Roughly 90 feet?

A. Uh-huh.

Q. The local wells in the area, what range of depths do they have?

A. They're typically down 120 or more feet. And when I looked through all the well logs, uhm, they'll -- they'll all be cased off through this unconsolidated material, because the hole would cave in. So there's steel casing that's placed down into rock. Because the Maquoketa doesn't produce water, they tend to go down with the casing to the top of the Galena or maybe partly into the Maquoketa.

A lot of times the Maquoketa is not left open because, one, it doesn't produce water; and, two, you can get some of those sulfide effects, you know, the water quality isn't good in this. So it would come down in here, and then once it's into the Galena they would fill it in.

Q. The Galena aquifer level, that -- you mentioned that it flows in a certain direction. Which direction is that?

A. West to east.

Q. And do you determine that by your soil -- or your borings at the outsides of the landfill?

A. Actually a couple different ways. That was one way, so we use the actual site information that we had on wells in the Galena itself. And then there's publications on a regional basis that have been done looking at groundwater flow direction from the Galena, and it was consistent with those published papers on groundwater flow. And it's consistent with the known water usages in the area where there's much more groundwater released from the site area as you get into Kane County.

Q. The numerous soil borings that were taken on the property, how are those holes protected or filled after you complete that?

A. If a bore hole was drilled that was not used to install a well then that hole is filled, similar to what I described for private water wells. The material that's used is called a high solids bentonite grout. Bentonite is a very specific type of clay material that has properties that allow it to absorb and expand, and so it acts as a very good sealant for things like bore holes.

So those wells are -- a pipe is stuck down, it's called a trimming pipe. It's essentially a hose that goes to the bottom. There's a mixer that mixes up this material, it's pumped, so it's pumped under pressure into the bottom of the hole. The pipe is withdrawn so that the hole fills up, and you make sure that you fill up all the void spaces in that bore hole and you don't have anything that bridges and causes the bore hole not to be completely filled, and then that's pressurized until it runs out at the ground surface. Once that's done, somebody checks it after a couple days to make sure that hasn't settled. If it has settled they add additional bentonite to the top to make sure that it's up to ground surface and then restore the surface with topsoil.

Q. The monitoring wells that are on the site around the site, how are they protected from any back siphoning or from contamination moving down those?

A. In a similar way. Once the bore hole is drilled a pipe is put in. The bottom section of the pipe has slots in it so that water can enter it. That's a limited section, usually 5 to 10 feet long. Around that well screen is called, sand is placed, and then above the sand you have again bentonite material, first some chips that are placed and then it's again grouted with the bentonite -- high solids bentonite grout.

The space between the bore hole wall and the well pipe itself is grouted so that it eliminates any potential for a pathway along that well casing. And, again, that's grouted until it comes up to the surface, it's checked for such settlement. There's a cement cap that's put on and a protective casing that's put over the well that sticks up several feet so it's protected from surface water runoff and then protected just from a physical sense so that if somebody's out there with a vehicle and accidentally runs into it it doesn't wreck the well.

Q. You mentioned just a few minutes ago that you have looked at the monitoring well info but not reports. Can you explain the difference in those two?

A. I have not seen any private well sampling results. I have looked at all the private well construction reports that shows how they were drilled, how deep they went, and generally gives a description of the types of materials that were drilled through. It doesn't give the description to the degree that you can put soil classifications on it. But it does allow me to look at a depth and compare it to the different geologic layers.

Q. So you have been more involved in the construction of all these wells but not the monitoring of the samples that are taken out to be tested?

A. I am not clear when we're saying wells which wells we're talking about so --

Q. Monitoring wells, is there more than one monitoring well?

A. Well, we talked about monitoring wells and the private wells. So the monitoring wells, if you can repeat the question?

Q. Sure. The monitoring wells, you have been involved in the construction of them and the reports affecting the construction, but you have not been involved in the reports that show the samples and the results that have been taken when tested of the water from those wells?

A. No, I have looked at all the sampling of those wells also. So I have looked at sampling results from the monitoring wells and I have looked and helped with the construction of the actual monitoring well.

Q. Then the private residence wells in that boundary around the landfill, have you looked at the data, the results from the testing of those wells?

A. I have looked at all the private well construction reports, yes.

Q. But not the results of the water sample itself?

A. That's correct, besides the ones that are reported on the monitoring document -- or not the monitoring, the private well documentation.

MR. D. STEIMEL: I have no further questions.

HEARING OFFICER MCCARTHY: Okay. Ms. Cipriano.

MS. CIPRIANO: Thank you.

CROSS-EXAMINATION

BY MS. CIPRIANO:

Q. Good afternoon.

A. Good afternoon.

Q. I'd just like to revisit very briefly your experience again. In looking at your abbreviated resumT, you indicate on here that you have experience serving as a technical expert on a large indoor air site under the US EPA. Can you give me a little bit more description of what that entailed?

A. Yes. There was a groundwater approval that there were vapors coming up into the unsaturated zone. So when you go into the subsurface the upper part of the soils have air in them, and it's called the unsaturated zone. Below that you get into the saturated zone and you're below the water table. Vapors can come off of the groundwater and get into the unsaturated zone.

We looked at the vapors coming off of the groundwater plume moving in that unsaturated zone. It occurred in urban areas, so there was concern that the vapors could collect in residences, businesses, commercial businesses, and so we needed to go in and test all those businesses and residences, determine if there was any vapors coming off the groundwater plume, and then develop a system to alleviate any of those vapors in those buildings so that there was not any health concern for people in those buildings.

Q. And that would be a concern with vapors entering the air?

A. Yes.

Q. And so you helped analyze that and review that?

A. Yes.

Q. And is that sort of vapor-related issue one that you would handle at other sites as well where you looked at vapors that were happening in the soil and had the potential of entering the air and in your expertise then also was used to sort of determine how to address those situations?

A. Yes. One thing I have not talked about, in most of these remediation sites you need to complete risk assessments. And, again, for a risk assessment you need to look at all the different pathways, air being one of them, that constituents could be contacted by either people or animals in the environment, and so air would be a normal pathway that was investigated really on all of these sites.

Q. Okay. I just wanted clarification in my own mind, because I had a sense that you had that experience but I needed to get you to actually say that to me, so I appreciate that.

Now on the issue of groundwater, and as you know, I mean, obviously one of the main things that we're trying to accomplish today is just to ensure that the groundwater monitoring system that you have proposed -- Waste has proposed is monitoring and protecting the water usages in the area. So I'm sure you can appreciate the number of questions that have come -- come up with respect to what is proposed here today.

And we talked a lot about the private wells in the area, and maybe it would be helpful to have that popped back up again.

But I'm assuming that when we say private water wells we're talking about wells -- not only drinking water wells but also wells that are used for other things like irrigation; is that true?

A. Well, yes, I'm sure that wells used for irrigation would be constructed the same, you know, similar to the water wells, yes.

Q. And you mentioned that you looked at the depth of all of those wells and they are all sort of screened or situated in the Galena; is that accurate?

A. Yes.

Q. And then you also indicated that -- actually in response to a question that these wells are being tested by Waste Management annually currently; is that correct?

A. I'm not sure actually.

MS. CIPRIANO: Okay. Is there another witness that may be able to help answer that question.

MR. MORAN: Well, in fact, the testing that you're referring to are the wells that were identified in the 1989 siting approval, which as part of the conditions to that approval certain water wells were identified within a certain distance from that facility. It's not the water well locations identified here which are within a mile of the facility but only a more discreet number, specific number within a certain distance of the landfill, I believe down on Gurler Road and also on Somonauk. So that information, frankly, hasn't been presented here. It's part of that earlier siting approval. And we haven't presented that specific information, that's why Ms. Underwood was unaware of the testing because she's really had nothing to do with that.

Q. Okay, so that I think answers that. I had several questions on that. So you're just not familiar with that testing?

A. That is correct.

Q. Now, you did mention earlier that there was -- that you were aware of this sampling -- the

actual surface water sampling of union ditch?
A. That's correct.
Q. Is that correct?
A. Yes.
Q. Do you happen to know where samples were taken along union ditch?
A. I don't have the exact locations, but there were four locations and they're upgradient of the site area, downgradient of the site area and next to the site.
Q. So then, Ms. Underwood, in your professional opinion a monitoring system that is designed for this landfill in your opinion is properly designed to protect the current water usages in this area?
A. Yes.
Q. If we can now turn to some questions that were presented regarding the groundwater management zones, and just generally it might be helpful to again just very briefly describe what a groundwater management zone is.
A. When there are impacts detected that there might be actions taken against, the IEPA develops a groundwater management zone around

the site, and that's the area where testing will occur and where the area that there are some impacts in is defined. And so it's used to be able to say, okay, we're going to go back for you to test in this area to look at how things clean up as you put it in front of the remediation system. So it's that area that's used to manage impacts.

Q. And you sort of implied in your answer that this is something that's established with the Illinois Environmental Protection Agency; is that correct?

A. Yes.

Q. So they review it and approve the groundwater management zone itself and for what occurs within that zone; is that correct?

A. That's correct.

Q. And there is two different groundwater management zones; is that correct?

A. Yes.

Q. And there was not a lot of discussion about the groundwater -- the east groundwater management zone. Are you familiar with the east groundwater management zone?

A. Yes.

Q. And if you can just -- again, just give sort of a brief description -- let me ask one question. Are you familiar with the current monitoring results associated with the east groundwater management zone?

A. Yes.

Q. And can you just generally describe those results and status and characterization and what is being found there?

A. Yes, the east groundwater -- or the east area is controlled through the gas SVE system, and it is capturing impacts caused by gas migration from the old area and it's working as it's designed to work, reducing the concentrations and preventing further migration.

Q. You had also talked about the east unit and the intention to replace a portion of that Henry formation with structural fill?

A. Yes.

Q. And could you tell me what material the company is intending to use to replace the material that's currently there?

A. Uhm, I don't know the exact specifications, but generally it's going to be coming from material that is being excavated, which would primarily be from the Lemont formation.

Q. From the Lemont.

A. So that would be predominately clay with some sand and silt in it.

Q. But certainly a -- the intention would be, correct me if I am wrong, to put in material that is actually better than the material that is found in the Henry formation?

A. It would be.

Q. More stability?

A. It would be a lower permeability material, yes.

Q. Now I'd just like to turn to the application documents themselves, and on -- particularly on Page 12-1 the application states that the plan is to replace groundwater monitoring well G24M with a new well G-205, which I understand is to be located closer to the waste. Why is that necessary?

A. In developing a monitoring program for the site there is a 100-foot distance set around the landfill, and your groundwater monitoring wells need to be within that 100-foot zone. So when the limits of waste are pulled back we need to move the monitoring wells to be within that 100 feet of the landfill.

Q. Okay, and it also indicates that five additional groundwater monitoring wells will be installed in the Henry formation. I wasn't quite sure if that was on the plan that was that last slide that you -- of your presentation. I can't think of the page number.

A. It is.

Q. And could you explain why those are being added?

A. The wells are down here, five wells down here. And, again, this is right adjacent to union ditch. So there is some Henry formation along union ditch in this area, so there's the monitoring wells placed in that Henry formation.

Q. And that is just to ensure that you know, again, what's occurring in the Henry formation in that location?

A. Yes.

Q. And now I'd like to turn to Appendix N-1, which is actually found in Volume 5 of the application. And that contains the raw model output for the well spacing determination. And can you just explain what a well spacing determination is and why it's important?

A. Yes, a well spacing determination is looking at the spacing of monitoring wells required to be able to detect any unanticipated release. There is a calculation, it's done through a computer program, that's used to predict and help set what the distance of the monitoring wells need to be. The appendix that you're referring to has the output from those calculations that look at what is the monitoring well spacing. In developing that monitoring well spacing calculation we made assumptions to assume that there is a 1-square meter hole in the liner system, essentially there's no liner system at all, and we ran it trying to develop a plume to look at the well spacing. We couldn't develop significant concentrations in the aquifer -- or not in the aquifer but in the material underneath the site because of the way the landfill is designed and the way that hydro -- groundwater works, but that's what the appendix is and that's the calculation.

Q. So in the application in what is entitled Table N-1-1 there is a begin time and an end time in terms of when the models run, and this is -- in this particular table it's indicated that it was run for a 140-year period, and then in looking at the actual printout of the modeling it -- that document -- that document indicates, the first page indicates it was run for 140 days. Can you explain the difference in the description of how this model was run?

A. Yes. In the documentation for the model it indicates that the input parameters that you put in to run the calculations need to be in consistent units, and the output will be given in those same units. There's a glitch in the program on the labeling so that even though it went in at 140 years it shows up as 140 days simply because it's mislabeled in the program.

Now, to check that, I reran that using different parameters, so using different times -- days was one of them and minutes was one of them I believe -- to see what the output looked like and the output was always labeled as days, so we know it's a labeling issue and not a calculation issue.

Q. And there was some talk earlier about the Illinois EPA requiring the performance of a groundwater impact assessment, or a GIA. Now, will the well spacing modeling be included as part of that document that's -- the assessment that's presented to Illinois EPA?

A. Yes, the well spacing is a separate calculation from the GIA assessment, but they are both required to be submitted to the IEPA.

Q. So the Illinois Environmental Protection Agency will also have an opportunity to review the modeling that you performed and ensure that they're comfortable with how it was performed; is that correct?

A. Yes.

MS. CIPRIANO: That is all we have. Thank you.

HEARING OFFICER MCCARTHY: Thank you.

Members of the committee?

MS. TOBIAS: Yes.

Ms. Cipriano, you asked my question about the structural fill and why it was better.

CROSS-EXAMINATION

BY MS. TOBIAS:

Q. We have been told that clay is an excellent base and that there's quite a bit of clay underneath the landfill. Is that -- is that true? I mean, is there a lot of clay there? Is that a better base for a landfill? Is it -- I mean, I know you have gone through a lot of the structure here but --

A. The real protection comes from the design of the landfill. There are clay materials that do not allow water to be easily transmitted, and those were the Lemont formation and the Tiskilwa formation and that old glacial till. So yes, there's clay, it's beneath both sides, and it does prevent water to flow through those materials.

MS. TOBIAS: Thank you.

MR. ANDERSEN: I have one question. Ken Andersen, District 3.

CROSS-EXAMINATION

BY MR. ANDERSEN:

Q. Going back to the smells and the gases. How far can the smell of H_2S travel? Is that -- is that -- I think that's what I want to know, I'm not sure.

A. Well, because your nose can detect it in such a small quantity a molecule can go, you know, a fair amount of distance, so you're able to detect it some distance away from its sources. I don't know what that exact distance is, it depends on what the air conditions are like, but you detect it at that 0.5 part per billion level. So it's just a tiny little bit is able to be picked up by your nose at some distance away.

MR. ANDERSEN: Okay. Thank you.

MR. STODDARD: Good afternoon, Paul Stoddard, DeKalb Board, District 9, and associate professor of geology, as some people know.

First off, I was wondering if it would be possible to get for the record a copy of your full resumT with all your publications?

MR. MORAN: Certainly, that would be very possible.

MR. STODDARD: All right. I think it would help us if we can see what you have published on in terms of levels of expertise, especially about gas and gas dispersion and so forth.

CROSS-EXAMINATION

BY MR. STODDARD:

Q. In the meantime, what are the differences between the Tiskilwa and the Lemont tills? How would you -- how would you identify them from each other?

A. There's a couple things that we use to be able to differentiate those tills. One is color differences that we saw, and when we're in the field we have color charts that are used to be able to objectively assign colors to the different units. Those colors are reported on the boring logs.

The other thing that we look at is the distribution of the various grain sizes, and so there's slight differences in the amount of clay, silt and sand material in those units, and so we can look at the comparison of that.

We can also look at the Atterberg limit tests to review that, and then also its position in the subsurface and its separation by the Lacustrine layer mainly.

Q. Okay. You mentioned the difference in grain sizes. When I -- when we were first informed of the clay layer, when we were first talking about this, the clay layer was mentioned and I said, oh, that's good, clay is very impermeable. When I started taking a look at some of the boring logs -- B-O-R-I-N-G, not logs that put you to sleep, I noticed that, as you just stated, that it's not true clay, there's a lot of coarser grain particles in there. What do those do to the permeability of those various tills, vis-a-vis a true clay layer?

A. Yeah, actually when you have a mixture you tend to decrease some of the permeability because you can have the small particles fill in the spaces between the larger particles. So just because you have a mixture of particles it doesn't mean that it makes it's a higher permeability. So it actually a lot of times helps decrease the permeability because it's not one grain size.

Q. Wouldn't a system that was true clay, very, very fine materials, actually have a higher -- a lower permeability than a mixture, or am I wrong in that?

A. Well, if you -- in some marine systems that's true, and it sort of just depends on how the clay was laid down. So clay laid down in a lake might be not as compacted.

Q. Okay, I see, okay. Thank you. Can we go to cross section C-C prime for a moment. Okay. As a geologist there's one aspect of that that really offends me.

A. I'm going to apologize now.

Q. Well, maybe it's not your fault. The Henry formation, you did allude to this, you show it both underlaying and overlapping the Lemont formation, which would imply that it's both younger and older than the Lemont. How is that possible?

A. In the State of Illinois they reclassified the glacial units, and they generally classified them by water laid deposits versus diamictons, or glacially derived deposits. There's a figure in my report, it's Figure 5-2, that indicates how they assign the names of the different glacial units. And because of the way they classified the Henry formation, it can occur a number of the different places stratographically in the different layers. So you can repeat the Henry formation between stratographic units. It is an odd thing. Yes, I can understand why you would have that question, but it's a nomenclature that's been adopted in Illinois.

Q. It's good to know that our craziness goes past politics and reaches scientists.

Okay. Moving on -- we'll get back to that one in a little bit.

Could you put up the strat section, the layers of rocks. That -- thank you, that was good. I'm impressed.

Okay. Just so that we're -- we know that we're talking on the same page here, could you define for me an aquitard and the difference between it and a confining unit?

A. An aquitard and a confining unit are usually meant to be the same thing. They're units that do not readily transmit water. Confining units are confining, or above, another aquifer unit -- an aquifer unit so that they hold the pressure in in the underlying aquifer unit. But a confining unit has to be an aquitard.

Q. So you're using aquitard then to really mean --

my understanding of it was more that it still allowed communication of water but not nearly as much as an aquifer. But you're saying it's actually much more restrictive?

A. Yes.

Q. Could you give me, for example, permeabilities of aquitards versus a nice aquifer, like maybe the St. Peter or something?

A. The St. Peter -- the units that we usually work in are centimeters per second, so it's a -- it's not a velocity or anything, it's a number that gives you an idea how the water flows through the material. For something like that St. Peter sandstone it would have a hydraulic conductivity around 10, 10 to the first or 10 to the zero centimeters per second. Aquitard materials are going to be 10 to the minus five, 10 to the minus six, so almost a million times lower in hydraulic conductivity than good aquifers.

Q. Okay, so I'm looking at the units. We have got the quaternary, which is all the glacial tills and so forth, which in this case are some pretty impermeable units, and then there are things like that Henry and the Lacustrine, which are more permeable, and those are going to serve as our aquifers in the upper units. Then we have got the Silurian dolomite.

And for the benefit of the audience -- I think I know the answer to this one -- could you tell us the difference between a dolomite and a limestone?

A. Yes, a dolomite is a limestone that's been altered. When limestone is formed it's done -- it's formed in an ocean environment and there's salient water that's part of the formation of that material. Fresh water comes into that formation and then the rock is altered so that there's less calcium and more magnesium in the actual rock material itself. So it's a slightly altered limestone material.

Q. Okay. Now, limestones, and therefore dolomites, can actually when they originally form be very impermeable; is that correct?

A. Yes.

Q. And so for the Silurian dolomite to be an aquifer how does it go from this rather impermeable state to being something that transmits water?

A. Yeah, the Silurian, it's not a great aquifer, but what happens is as the different sediment layers are laid down there's -- the individual layers are called beds, and as the rock hardens you'll get a very, very small separation in those beds, they're called bedding planes. And most of the movement in water and things like the Silurian dolomite occur amongst those bedding planes. So it's not like the whole rock mass becomes permeable, but you have some small bedding planes that can transmit water.

Q. Okay, so this is not fracture permeability then?

A. There is some fracture permeability too, that would be associated with the Silurian Dolomite.

Q. Okay. Then I think at least for the municipalities -- I can never say this.

A. Maquoketa.

Q. Maquoketa, thank you. The Maquoketa is pretty important because that's going to keep out any impurities from the surface, that's what's keeping it out of the drinking water for the municipalities since you said most of the municipal wells are getting their water out of the ancill, and actually it's doing good for the private well since it's sheltering them because they're getting water from the Galena-Platteville.

So the Maquoketa turns out to be a very important unit in terms of our drinking supply; would you agree?

A. Yes.

Q. So let's talk about that one for a little bit. That's basically shale which is very impermeable; is that correct?

A. Yes, it's a mud that's been hardened into rock.

Q. Okay. The only way water would penetrate that would be if that unit had been fractured; is that correct?

A. Or a lot of times if there's any kind of open bore hole that goes through the Maquoketa.

Q. I was thinking more naturally, but yes, I'll get to the bore holes in a moment.

A. And the fracturing in the Maquoketa would be different than fracturing in Dolomite because it's a different type of material, so it doesn't fracture. Again, it's a softer type of rock, so it doesn't fracture the same way that Silurian dolomite or Galena-Platteville dolomite would fracture.

Q. Do we have any observational evidence of the fracturing of this, or are you basing that assessment on the nature of shales and more rigid -- in between more rigid beds?

A. Well, the evidence that we know that we have that says it acts as a confined unit and we don't have the fracturing is the fact that the underlying aquifers are pressurized, and for them to be pressurized you have to have something holding that pressure in and what's holding that pressure in is the Maquoketa shale.

Q. Not even water -- I mean not water, not even gas will penetrate that Maquoketa?

A. Right. And gas typically -- I mean, you see a little bit of natural gas in the systems, but gas in general doesn't move below the water table because all the pore spaces are full of water.

Q. Gas is lighter than water?

A. Right.

Q. Okay. I think that's all I needed from this one. Okay. Thank you.

Moving on, let's -- you raised the issue of the well and wells allowing for communication between the surface water and the lower groundwater levels. And when you talked about the monitoring wells you spoke of how they're cased, and then between the piping and the drill hole itself -- the drill hole to the side that bentonite was in place to prevent communication between different layers.

Now, you have seen the construction on the private wells. Are they equally engineered?

A. Yes, in the code requirements for water well construction you have to grout the casing in, so the casing goes down into usually the top of the Galena and then that would have to be grouted in in a similar fashion.

Q. Okay, thank you. That's good to know.

Let's -- if we can quickly pop back to C-C prime. All right. And when Mr. Steimel, the younger, questioned you he asked about the shale unit above the Galena, the Maquoketa -- thank you -- and noted that the level of the Galena shallows towards the west end of the region. And to me this looks like a very thin shale. Is

that more a function of the way of the schematic
or does it really thin that much as -- how thick
is it?
A. It is thinner on the west side, so. Uhm, I --
this is about 30 feet I believe over in this
area because of the bedrock surface being
eroded, but then what happens is you get more of
this glacial till. So although this thins, this
thickens.
Q. And the till, we have established, is
relatively impermeable?
A. Yes. And when I said this I was talking about
the glacial till.
Q. Right. Okay. I do that so I don't have to say
words like Tiskilwa and Lacustrine and so forth.
The issue was raised yesterday of gas
migration underground. Can you speak to the
possibilities of -- I mean, were there to be a
leak in the landfill a possibility that that
would lead to penetration of gas into the
geologic system, into the rocks, and then the
possibility that that would migrate any
distance?
A. Yes. Gas migration occurs above the saturated

zone, or above the water table. So as you go into the subsurface the upper part of the soils have air space in it, that's called an unsaturated zone. Below that all the spaces -- all the pore spaces filled with water. The gas can't migrate below the water table because if -- there's no space for it to move through, plus it wants to go up into the air. So although there can be gas migration in that unsaturated zone the gas really wants to go up into the atmosphere, so it will leak out of the soil and then go up into the air.
Q. Again, could you remind us where is the water table in this cross section?
A. The water table isn't shown on the cross section, but it's usually within a few feet, maybe five to 10 feet at the most in this area. So there's not a very thick unsaturated zone.
Q. Okay, so that would be in the Lemont --
A. Yes.
Q. -- surface units that you have got there?
A. Yes. That's why there's so many drain tiles in the area, because it's a high water table.
Q. Okay. Now, how can -- I am now confused. You

said there's very little permeability and I assume very little porosities in the Lemont and Tiskilwa. How can we have a water table up near this?

A. Water can -- well, first of all, because of the low -- the small pore space it will wick, essentially, water into it. So it can hold water but it doesn't release it and it doesn't take it easily, but over long periods of time it's going to become saturated. So you have water in it but it doesn't really move.

Q. Okay, and so presumably any gas that was also in there would also not be migrating very quickly laterally?

A. Yeah. In clay materials a lot of the porous spaces still fill full of water and there's a little bit of air space too. So it doesn't migrate through clay very easily.

Q. Okay, and so where you detect gas in the groundwater in one of your monitoring wells -- you said you don't test for H2S in those wells, but you do test for other methane and other gases, or no?

A. No, we would test for any constituents that

could be carried with those gases.
Q. Okay, so if -- you would know that the gases are there because of the constituents that go along with them?
A. Yes.
Q. Okay, and you would have plenty of time to find that and make sure it didn't get very far?
A. Yes. There are gas probes that are also surrounding the landfill, and those are used to monitor for methane and for the gases specifically --
Q. Okay.
A. -- above the water table.
Q. Right. Okay. You talked about the well spacing model and then you talked -- you mentioned that one of your input parameters was the size of a hypothetical flaw or -- in the wire and that you couldn't get the plume to develop. I'm assuming from the name that the well spacing model is what you used to determine how closely the wells should be spaced along the sides of the landfill?
A. Yes.
Q. If you couldn't get a plume to develop how did

you end up determining what that plume spacing should be?

A. IEPA has a default well spacing in those situations, and it's 300 feet, and that's what we used.

Q. Okay. In your expert opinion is it possible that you could get a narrow plume between that -- those wells that would then cause problems outside the area of the landfill?

A. No, and the reason is in low permeability materials you don't get narrow plumes that develop. Narrow plumes develop when you have a material like the St. Peter sandstone. So that would not occur.

Q. Okay, thank you. What about over on the other -- well, I'm looking there. But on the east side you said that there was some fracture permeability in the Silurian dolomite. Could that provide narrow conduits that might sneak between monitoring wells?

MS. UNDERWOOD: Bruce, can you go up to the Silurian dolomite contour map, please? One more.

Because there is also Lacustrine material and because the permeability is still not great you would expect if there was that hypothetical leak that you would still have the plume dispersed, so as it moves away what that means is it moves away from the hypothetical leak and we put that near the boundary of the landfill. So we don't put it up here, we put it near here to look at how it would develop. It moves -- the water moves slowly enough that that plume would widen and you would be able to detect it that way.

Q. Was the Lacustrine the one that was not present over -- yeah. So would that help us then -- you said you're looking at the Lacustrine to help spread out the plume but -- well, okay, because the groundwater is going in that direction. Never mind, I see what's happening.

Maybe you should explain it for the record anyway. If you could go back to the -- thank you.

MS. UNDERWOOD: Go back one slide.

MR. STODDARD: No, that's the right one.

You said that because of the Lacustrine, which is a very low permeability, that would tend to spread out the plume but yet a large area of the eastern section is not covered with Lacustrine. So how does that affect the model that takes that, the plume would spread out?

A. The model was actually run based on the permeability of the Lacustrine unit, which is higher than the clay, than the till units. So it's assuming some relative higher permeability. And with that higher permeability we still could not develop the plume. But -- so when -- we can't develop it, we can't cause a hypothetical leak to a degree to cause a plume. And the reason is, the way the landfill is designed the hydraulic pressure will be inward towards the landfill, and so you can't cause anything to leak out if the pressure is into the landfill.

Q. Okay, so even if the leak were in the region of the fill that is not underlined by the Lacustrine, that would not matter?

A. Right.

Q. Okay. A lot has been -- a lot of gas talk has been going on. I don't know what that means in terms of the people that talk it but -- as I'm one of them.

Okay. You gave us some information regarding toxicity levels or concentrations for H2S, and you were asked about your qualifications to do so. Uhm, just to be clear, you did not derive any of those levels yourself, correct?

A. That's correct.

Q. You got those from various agencies, like the one --

A. ATSDR.

Q. Right, and perhaps OSHA and others.

Would you say in your professional experience and academic experience that you've got expertise in these agencies, their estimates of what these toxicity concentrations are?

A. Yes, there's a lot of scientists behind the calculation of those levels, so there's epidemiologists and --

Q. And your knowledge of what those levels are is something that's important to your protection?

A. Yes.

Q. Okay, thank you. Now, you -- one of the papers I believe that's been referred to is a paper about the vapor intrusion, and you have described that a little bit. Essentially would I be correct in assuming that that has to do with the way gases move and so forth?

A. Yes.

Q. Okay, and you have testified about that the main danger from H2S is in an enclosed space because the gas cannot disperse?

A. That's correct.

Q. Okay, and we know that on a landfill the workers, and especially those working near the open wells, need to be carrying an H2S monitor because the levels right at that well could be dangerous?

A. Yes.

Q. Do you have any feel for how quickly a dangerous concentration, say a worst case scenario a lethal concentration, of H2S in our 500 parts per million range, how quickly would that dissipate with distance?

A. I don't know, but it would -- I would guess if you walked even a hundred feet away you would be out of that area. The reason being that you don't have a way to develop a large area of just H2S, uhm, and you need to be able to keep the

H_2S confined to be of concentration high enough to be a problem.

So if you just walk away from the well itself, and not -- I don't think it would be very far out, although I don't have the exact calculations, you would get outside of the danger zone. So people that would wear a monitor and, say, it would go off would simply need to walk away.

Q. Okay, thank you. I think I'm wrapping up here. Are you aware of hydrologic studies of landfills in the literature?

A. Yes.

Q. Are those things that are constantly -- those studies constantly being produced?

A. Yes.

Q. Even today?

A. Yes.

Q. Okay, and again, in your experience in monitoring these and so -- monitoring the groundwater around landfills designed such as this with the various liners and so forth -- I believe you said this already but just -- again, have you ever noticed any instances of leakage from a landfill evident in the monitoring wells?

A. No.

MR. STODDARD: Okay, and let me just make sure I have nothing else.

Yeah, okay. That's all I have. Thank you very much.

HEARING OFFICER MCCARTHY: Any members of the County Board? Yes, Mr. Andersen.

MR. ANDERSEN: I have one follow-up question, if I may, please.

CONTINUED CROSS-EXAMINATION

BY MR. ANDERSEN:

Q. North of this site of the proposed landfill site is a stone quarry six or eight miles north of there. When I see your cross sections up here on the board and my familiarity of that stone quarry I see pretty much the same cross sections.

My question is, is there any possibility of their mining activities, and probably the blasting, causing any problems that could transfer that blast to the landfill and cause any cracking problems or anything else that could hurt the integrity of the landfill and the liners?

A. I have not done that analysis, but I have worked on sites where there's quarries much closer than that and it has not been a problem.

MR. ANDERSEN: Okay. Thank you.

HEARING OFFICER MCCARTHY: Any other members of the County Board have questions of this witness?

Anyone else present who may have some questions?

MS. SLAVENAS: I have questions. You need my name again?

HEARING OFFICER MCCARTHY: Uh-huh.

MS. SLAVENAS: Right, okay. My name is Rosemarie Slavenas, S, like Sally, L-A-V, like Victor, E-N-A-S, and I live at 1629 Park Avenue in Sycamore.

My first concern is about the height of the landfill. My recollection is that we were told that it would be 80 feet in height; is this correct?

HEARING OFFICER MCCARTHY: Are you directing your question to this witness?

MS. SLAVENAS: Well, I have no idea who

here -- there are all sorts of people I have seen here from Waste Management, and if there's anybody from Waste Management that can even either concur or negate that height I would appreciate that. 80 feet is what I heard. Is there anyone from Waste Management that knows how high the landfill is expected to be?

MR. MORAN: Well, as we indicated, on the area west of Union Ditch No. 1, 80 feet is the height. It's the currently permitted height. It is the height that will apply as well as to the expansion on the west side. The east side east of union ditch the peak height at certain points will be 113 feet.

MS. SLAVENAS: I would like to point out that I think this is very, very high. On average a ceiling is 8 feet, and the last thing you said was 150 feet?

MR. MORAN: 113 feet.

MS. SLAVENAS: 113 feet, thank you. So we're looking -- let's say a house is approximately, what, 20 feet high. This would really be quite a blight on our landscape. And as it was pointed out before, we're coming in from the east side of town. One of the things we know is that the suburban area likes to come out here because our property is less expensive than St. Charles, Geneva, etcetera, and it's very fast, and this is extremely unattractive as far as people coming from the east to have a landfill 113 feet high.

Now, some of you that are clever with space may be able to estimate how high this room is, but I doubt seriously that -- you know, I would think 113 feet at least twice this high. And here we are in the prairie, I'm concerned about that.

Thank you for your answer.

Another thing I have a concern about, it's more of a question and I -- we can't talk to the County Board members now or they can't talk to us, I'm not sure how this works, but I also have a concern about the bonds that have been sold, as I understand it, and if someone can correct me if I am wrong, my -- what I have heard is that bonds have been sold for building a new jail and expanding the courthouse.

HEARING OFFICER MCCARTHY: Well --

MS. SLAVENAS: Well --

HEARING OFFICER MCCARTHY: -- I'm not from DeKalb County, but that question has been answered a number of different times. Apparently there was an ordinance or a resolution passed enabling bonds to be issued. They have not been issued.

MS. SLAVENAS: Okay. Thank you.

HEARING OFFICER MCCARTHY: Now, could I interrupt you for just a moment?

MS. SLAVENAS: Yes, please.

HEARING OFFICER MCCARTHY: Your comments are sort of in the nature of a public comment, and I don't want to discourage you from making the comments. However, at this time we have a witness that we would like to ask questions. You know, are there specific questions that you have of this witness?

MS. SLAVENAS: Uhm, when I got up I wasn't really sure whether the witness would answer this or not. She had been answering questions about the landfill, so that question has been answered. So I don't have further questions of this witness or anyone from Waste Management about the landfill.

HEARING OFFICER MCCARTHY: Okay. We'll give you another opportunity to make a public comment if you would like.

But at this point I'm wondering are there any additional questions of this witness?

Yes, sir.

MR. MELLOTT: Do I need to repeat my name?

HEARING OFFICER MCCARTHY: I'd appreciate it.

MR. MELLOTT: My name is Kerry Mellott.

Ms. Underwood, a couple of times and just recently, in fact, you referenced something called the ASDR -- ATSDR. Could you tell us what that is?

MS. UNDERWOOD: The Agency for Toxic Substances and Disease Registry.

MR. MELLOTT: Okay. I wanted that in the record.

I happen to have a printout here from that agency, which is a subagency of the Center for Disease Control, a government agency that is responsible and concerned with public health and other issues. The article I have in front of me is labeled, potential for human exposure, and it regards hydrogen sulfide.

With regard to your testimony this morning from the Scientific American article, I wonder if you're familiar with this passage I'd like to read you, very short, and then I'd like to get your opinion of it. It concerns a situation where a child was exposed to hydrogen sulfide. I have printed this on both sides and am not remembering where I saw this from my previous printout which was one-sided.

Yes, here it is, under general population, occupational exposure. Again to hydrogen sulfide, particularly exposures of children. Okay, let me read this. This is a clinical case involving a 20-month-old child whose parents live beside a coal mine where a burning tip had been emitting hydrogen sulfide for nearly one year. The patient had symptoms of ataxia and an abnormal CT scan of the brain. This was presented in paper in 1987 by Catanday (phonetic), et al. Monitoring data showed that the hydrogen sulfide levels in the area were approximately point zero -- or 0.6 parts per million but may have been higher before the data were collected.

How would you characterize 0.6 parts per million of hydrogen sulfide exposure over the course of one year? And back to my question, are you familiar with this literature?

MS. UNDERWOOD: I've looked at a lot of ATSDR literature. I don't remember that specific passage.

Areas of mining and gas wells of coal mines, just as you mentioned, are areas where hydrogen sulfide is generated. And the 0.6 parts per million would be lower than what's allowed in the workplace and that's -- I mean, that's what it is.

MR. MELLOTT: You're -- what were the monitors -- the hydrogen sulfide monitors set to alarm at?

MS. UNDERWOOD: The workers on the site are alarmed at 10 parts per million over an eight-hour time weighted average concentration.

MR. MELLOTT: So that's substantially higher than this particular clinical case at 0.6 parts per million for a one-year exposure?

MS. UNDERWOOD: Yes, it's higher than that 0.6.

MR. MELLOTT: Okay.

MS. UNDERWOOD: The 10 parts per million assumes a continuous work week exposure, so that's for somebody that works in that environment --

MR. MELLOTT: An eight-hour time weighted average at 10 PPM --

MS. UNDERWOOD: -- every day.

MR. MELLOTT: -- would be an OSHA permissible exposure level?

MS. UNDERWOOD: Yeah, for every -- for five days a week.

MR. MELLOTT: So those folks who happen to live in the vicinity of the generation of hydrogen sulfide could certainly have a greater exposure even though this generation point might be at a fairly low level, you know, the collective or the sum of the exposure could, in fact, be significantly higher than what the workers at a site might be exposed to; would that be correct?

MS. UNDERWOOD: No, I don't believe that's true.

MR. MELLOTT: Would that be possible?

MS. UNDERWOOD: The workers are going to be the ones that are most exposed to the gas. So somebody further away, substantially further away would never reach the same kind of exposure levels that those workers would.

MR. MELLOTT: So in this article this 20-month-old child who had neurological problems and was apparently exposed for at least a year, how would that have happened?

MS. UNDERWOOD: Well, as the article itself says, they don't know what the levels were. They could have been substantially higher. And coal mines are going to generate much more hydrogen sulfide and be able to vent that hydrogen sulfide in a much more broad area than a leachate well.

MR. MELLOTT: Okay. Well, in this particular article it says that they lived beside a coal mine where a burning tip had been emitting hydrogen sulfide for nearly one year. What is a burning tip?

MS. UNDERWOOD: I don't know. I'm

assuming it's some type of a flare, but I don't know.

MR. MELLOTT: Okay.

MS. UNDERWOOD: But if you're right next to the coal mine that's -- that would be like somebody standing inside the landfill.

MR. MELLOTT: Generally speaking would zoning regulations preclude someone from living right next to the coal mine or would they be living within some specific distance? How would you see that?

MS. UNDERWOOD: I don't know of the land use regulations in coal mines.

MR. MELLOTT: Okay. Again obviously we have to look at the paper -- the 1987 paper that describes this clinical case. But my point is, just for the record, to show that there are instances where exposure of very low levels at the subpart per million range have apparently impacted children, in this case a 20-month-old child.

Let me move on from that. You mentioned this morning when you were describing the odor threshold concentration level for hydrogen sulfide that it was only -- what did you say, a part per billion or something?

MS. UNDERWOOD: A half a part per billion.

MR. MELLOTT: Half a part per billion, of course, which is obviously very, very low. You didn't say, as I recall at least, although I think maybe Mr. Hoekstra said yesterday, that there is a point in which the olfactory response dies away and that if the level of hydrogen sulfide is high enough there is no response, you are not humanly aware through your nose of that presence of hydrogen sulfide. Do you know what that level is?

MS. UNDERWOOD: I think it was up in the hundreds of parts per million. So as you get to that hundred part per million then you will get olfactory fatigue and so after a period of time you won't smell it.

MR. MELLOTT: What do you believe would be the significance of that for either a worker on the site or a resident within the area?

MS. UNDERWOOD: Well, for a worker on-site that's the purpose of having the monitors, because you can't just rely on the smell to say if you're in a dangerous situation or not. So the specific need for the monitors is because of that -- or that's one of the reasons, because of that.

The only reason is because emergency workers that go into situations that deal with hydrogen sulfide have to understand that they can't rely on smell to say if they're in a dangerous situation. And that's how the accidents with hydrogen sulfide occur is because either a worker -- there's many documented cases where somebody goes into a sewer line, they don't smell it or they smell it and it goes away and they don't know they're in a situation, a rescue worker comes in and again doesn't understand the situation because the smell isn't a reliable indicator, and you have death.

So the significance is, for one, to recognize that that happens, especially for workers; and, two, to use other methods to detect hydrogen sulfide, which is why the landfill uses the hydrogen sulfide detectors on their personnel.

MR. MELLOTT: How frequently are the

hydrogen sulfide detectors calibrated?

MS. UNDERWOOD: I don't know. There would be -- in any health and safety plan there are calculation procedures and a time frame that those have to be looked at, but I don't know what the specific ones are.

MR. MELLOTT: This morning when you discussed your visits to these landfills you mentioned that you were aware of or you knew when you needed to be aware of that problem with -- or the possible presence of hydrogen sulfide. Did you ever take with you or any of the workers that you supervised a gas detector that was attuned to hydrogen sulfide?

MS. UNDERWOOD: Yes.

MR. MELLOTT: And when you did take these with you did you know they were in calibration?

MS. UNDERWOOD: Yes. We would typically calibrate those instruments on a daily basis, so before you go out in the morning you would check the calibration.

MR. MELLOTT: Okay. Thank you. Could you explain for us the difference between a vapor and a gas?

MS. UNDERWOOD: I would say they're the same.

MR. MELLOTT: So there is no difference between a vapor and a gas?

MS. UNDERWOOD: A vapor would be a gas.

MR. MELLOTT: So then I believe that someone stated earlier from your resumT you had written on vapor intrusion into landfills; is that correct? Am I remembering that correctly?

MS. UNDERWOOD: Vapor intrusion in the subsurface and into structures.

MR. MELLOTT: Okay. Is there a difference between, for instance, water vapor and hydrogen sulfide gas; one being a vapor and one being a gas?

MS. UNDERWOOD: They're both gases. The composition is different.

MR. MELLOTT: Aside from the molecular composition, again is there a different structure between a vapor and a gas? What -- I guess I'm getting back to my first question, you know, when does something cease being a vapor and become a gas or vice versa?

MS. UNDERWOOD: I would say a vapor and a gas are the same.

MR. MELLOTT: Okay, same answer. I guess where I'm going with this is permeability. When I looked at the literature I could find very, very little on gas permeability relating to either liners, natural clays. The industry in general has -- or the waste -- the landfill -- let me say this: The landfill industry in general seems not to have a great deal of information in the literature on gas permeability or gas transport, gas dynamics, those kinds of things. I did find a great deal of information on hydraulic transmission or conductivity.

And it seems to me -- and I'd like to ask you if this would be correct -- when folks in this business speak of permeability are they generally referring to water permeability?

MS. UNDERWOOD: Yes. Most of the time you'll hear it talked about in terms of liquid, uhm, but there are -- there is a literature on gas permeability in liner systems and things like that. And there was actually a second paper that I wrote a number of years ago that talked about gas migration in the subsurface when there was some de-watering of some of the geoliner layers and the gas was allowed to move into those units then.

MR. MELLOTT: Okay, so I'm concerned with the possible gas migration that was mentioned a few minutes ago in your testimony. At one point you said that it tends to move up into the air. Why would that be the case? Why would gas tend to move up into the air?

MS. UNDERWOOD: Because gas is going to be light, so it's going to want to go up into the atmosphere. And just like water wants to follow the path of least resistance, gas can move through the air easier. So it moves through the air easier than the soil material, so it wants to go up out of the soil material into the air.

MR. MELLOTT: Is that true for all gases or just some gases?

MS. UNDERWOOD: It would depend on the type of gas. There are gases that because of the constituents in it are heavier and so they would tend to stay towards the surface of the ground or, depending on the different air pressures, could stay below the ground.

MR. MELLOTT: So do you know what the specific gravity of what hydrogen sulfide is?

MS. UNDERWOOD: I don't remember. It is heavier than normal air.

MR. MELLOTT: I looked it up last night. It's 1.19, so it's about 20 percent heavier than air. So in the case of hydrogen sulfide, would it be your opinion that hydrogen sulfide would not move up into the air but rather would tend to move downward and away from the air?

MS. UNDERWOOD: If you had a release of a bubble of hydrogen sulfide gas it would want to stay in low areas. Again, that's why it's such a concern for the landfill workers because if you're working in the pit it would tend to collect in that pit area.

MR. MELLOTT: Okay, and for methane, which is another -- perhaps the more larger amount of gas that's produced in a landfill, that would tend to move up into the air?

MS. UNDERWOOD: Uh-huh, yes.

MR. MELLOTT: And do you know what the specific gravity of methane is?

MS. UNDERWOOD: I don't remember, no.

MR. MELLOTT: It's about 0.52 I think, five something. So it's about half as heavy as air, so it would move up into the air.

Can you tell us whether or not hydrogen sulfide is entrained in methane gas generally speaking when it's at the surface at a landfill?

MS. UNDERWOOD: As a number of witnesses have testified to, gas concentrations coming from landfills tend to be less than 1 percent hydrogen sulfide. So hydrogen sulfide would just be mixed with the other gases.

MR. MELLOTT: Okay.

MS. UNDERWOOD: It doesn't occur as a separate gas.

MR. MELLOTT: Again, from the ATSDR literature that I have on potential human exposure they make a number of statements in here about both the generation of hydrogen sulfide and where it tends to go. A rather interesting statement that they make here is that sulfides, including hydrogen sulfide, constitute up to 1 percent by volume of typical landfill gases, that comes from the Agency for

Toxic Substances and Disease registry of 2001.

And they go on to say, as an example the Fresh Kills Landfill on Staten Island in New York has been estimated to release approximately 16 tons of hydrogen sulfide to the air annually. That comes from the Agency for Toxic Substances and Disease registry of 2000.

Here's an example from a government agency. Would you say this is an accurate characterization of what can happen at a landfill?

MS. UNDERWOOD: Well, Fresh Kills, first of all, is a much different type of landfill than what we're talking about in this siting application. It's a very large landfill and it -- I have no reason to doubt that the number that is estimated in there is not a decent estimation.

Now, when gas is generated, as people have testified to, it's controlled, it's collected, it's burned. I'm not familiar with specifically how it's treated at Fresh Kills. But that it generates that much H2S, that's a possibility or that much methane.

MR. MELLOTT: Okay, so it could be a representation -- an accurate representation of what can happen generally at least, even if not in the same proportion, the same absolute amount, at landfills?

MS. UNDERWOOD: To compare Fresh Kills to -- you'd have to look on an individual landfill basis. Fresh Kills is a very different kind of landfill.

MR. MELLOTT: But their statement that hydrogen sulfide could constitute up to 1 percent by volume at a typical landfill, would that be an accurate statement?

MS. UNDERWOOD: Yeah, and that's been mentioned previously, yes.

MR. MELLOTT: Okay, and 1 percent by volume, could you give us an idea -- we have been talking about units at parts per billion and parts per million levels and what the, for instance, a 10 part per million alarm response would mean to a human.

What does 1 percent by volume of a typical landfill gas amount -- how does that translate to 10 parts per million?

MS. UNDERWOOD: I'd have to do the calculation.

MR. MELLOTT: Okay. But wouldn't 1 percent by volume be a fairly large amount?

MS. UNDERWOOD: It certainly would be enough that there would be concern if there was that much hydrogen sulfide in the gas that you would want to have people wear the monitors, that's why they wear them.

MR. MELLOTT: You also referenced what you called a bubble of hydrogen sulfide gas earlier in your testimony. I guess that's a little hard to imagine exactly what a bubble is. But could that be a contained volume of hydrogen sulfide within the air flow above the surface or around a landfill?

MS. UNDERWOOD: When I was talking about that I was trying to convey a picture of an area that contains the gas. So when there's issues with hydrogen sulfide gas, such as around manure pits, a lot of times what happens is there's a release of hydrogen sulfide gas in a type of what I call a bubble. So there is a gas bubble that comes out of the manure pit and is in a concentrated area. So that's what I was trying to describe.

And around the well head at a landfill there could be hydrogen sulfide gas that's concentrated right there.

MR. MELLOTT: So you earlier talked about in your computer model a plume in the hydrogeologic process under the landfill. Could we for a moment make an analogy, a plume in the air of hydrogen sulfide that somehow manages to come from the landfill and be emitted into the air, would it be possible for your bubble, or however you'd like to describe it, to move through the air in such a way that it would be smelled, sensed, detected and have some sort of an effect some distance from the landfill?

MS. UNDERWOOD: I don't believe so. Now, the movement away from wherever it is would work similarly to a groundwater plume. So the mechanics of that would be similar. The amount of concentration that can move away would be, in my opinion, not an issue once you were away from that source and probably within a very short distance of the source area because the dispersion mechanisms in the atmosphere are much greater and the concentrations are low. The area is low.

MR. MELLOTT: So then would it be the partial pressure of the atmosphere and the partial pressure of that specific gas, hydrogen sulfide in this case, that would determine the amount of hydrogen sulfide that would be breathed in by anyone that happened to be in the way of that path of the moving hydrogen sulfide through the air?

MS. UNDERWOOD: There would be a number of different variables that would control the movement of the hydrogen sulfide away from wherever it was released. Partial pressure would be one of the input parameters that you would use in trying to do those calculations, but there would be many other variables that you would have to consider besides that one.

MR. MELLOTT: So then would it be difficult to predict -- if a large emittance of hydrogen sulfide were to occur at the landfill would it be difficult to predict the transport mechanism and the eventual location before final complete effusion into the atmosphere of that pocket of gas?

MS. UNDERWOOD: There's models that look at those kinds of situations. So I can't say, you know, how predictive they are, but there are models that are used to look at those kinds of situations.

MR. MELLOTT: Do you know whether Waste Management has looked or used any of those models in this particular proposal to expand the landfill?

MS. UNDERWOOD: There's been no calculations like that, again because the concern for a concentration at the landfill boundary that would be -- a health concern is not there.

MR. MELLOTT: Okay. I'd like to then ask some more questions about the permeability issue relating to gases, in particular both methane and hydrogen sulfide, with respect to the liners. It seems to me from listening to the testimony and from the research that I have done in this situation that clay -- and I don't mean Clay Campbell -- tends to be the ultimate decision in the functionality of the landfill. Would that be a good thing to believe, that clay is a very important part of the functionality of this landfill or any landfill?

MS. UNDERWOOD: The clay liner is a part of the landfill design, but there's other components that also contribute to containing gases and -- gases within the landfill.

MR. MELLOTT: If the clay liner, whether it be a natural clay liner or an engineered geosynthetic clay liner, failed would that be a difficult problem and would that perhaps create a health or safety problem for the landfill?

MS. UNDERWOOD: It's difficult to have clay liners fail. I actually don't know any good way to fail a clay liner except to dig through it. So I don't -- I can't think of a scenario where a clay liner fails.

MR. MELLOTT: Okay. I'll present one and ask for your opinion on it. Again, as I stated once a little bit earlier, in my research into this information in this industry I found very little about gas permeability, about gas transport modeling. The industry seems to be most concerned about groundwater transport. However, there is something that I did run into -- in fact, even -- to back up a step, even when I looked at the manufacturers of liners I found very little information in the product specification that regarded gas permeability. I found a great deal about hydraulics and fluid permeability.

Are you familiar with the work that's been done more recently by various government industries and private enterprises into concerns for radioactive waste disposal and gas permeability into the surrounding burial zone for those kinds of wastes?

MS. UNDERWOOD: I have not looked at radioactive waste disposal sites.

MR. MELLOTT: Okay, so you're not familiar with the new -- relatively new literature that pertains to those sorts of issues, and particularly with regard to the gas permeability issues?

MS. UNDERWOOD: I haven't looked at the radioactive literature.

MR. MELLOTT: Okay. Well, I'm not in

particular interested for this purpose -- this hearing in the radiological aspects of this. However, I did happen to find what I was looking for regarding gas permeability in those papers.

And one of the things I found -- and I would like to get your response to some of the things I found regarding gas permeability -- is that the bentonite clays are quite often used to prevent the conductivity of water fluids, and to some extent gases, have been looked at as helpful in these radiological waste disposal situations. And I found some information -- interesting information regarding the effectiveness, or lack thereof, of the various bentonite clays and other sorts of materials.

So this material research that they have been doing has helped me to understand a little bit more of how landfills are designed in general. Again, I'm not interested for the purpose for this hearing in the radiological aspect of this but only the information I can glean from that research that can be applied to these various kinds of clays.

So when a liner is put down -- well, let me back up a step. I asked Mr. Hoekstra this morning a little bit about this, but I'd like to ask you as well. Could you describe for us the liner that goes into the cell with the trench, is it a one-piece poly plastic or is it a two-piece or are there clays involved in it? What can you tell us about that?

MS. UNDERWOOD: There is a 3-foot recompacted clay, there's a bentonite mat, and then there's an HDPE -- 60 mil HDPE liner. The HDPE liner comes in rolls that are rolled out and then they have to be seam sealed and those seams are tested then.

MR. MELLOTT: In the geosynthetic fabrics that are used -- well, let me ask you specifically, in this particular -- I know you're not the design engineer but I figure you might have some experience or knowledge of how this happens.

In this particular landfill proposal are the liner materials called out, specifications for those, in the proposal, the siting application?

MS. UNDERWOOD: I don't know if this liner

-- well, to some degree they would be, yes, yes.

MR. MELLOTT: Do you know whether or not a natural clay liner of some thickness would be used as opposed to a geosynthetic fabric? Do you know which way, which method would be used here?

MS. UNDERWOOD: Both.

MR. MELLOTT: Both would be used?

MS. UNDERWOOD: Yes.

MR. MELLOTT: All right. Could you inform us for the record on how bentonite clays obtain their great power to be flexible? As you prescribed -- or described earlier in your testimony regarding earthquakes and crack zones and so on, you mentioned that they were flexible, could you describe to us how they are flexible?

MS. UNDERWOOD: I would -- the easiest way is to think of them as like Play-Doh like material. So when there's moisture in them they are very flexible. In fact, one of the tests that you do to do a field test of Atterberg limits is to take a piece of the clay and get it wet and roll it into a worm in your hands to look at the type of clay material in there or how it performed.

MR. MELLOTT: And what makes it flexible? I mean obviously people have all worked with Play-Doh either as a child or with their children. Is it the moisture in the clay?

MS. UNDERWOOD: It's the crystal lattice structure of the clay mineralogy that allows it to absorb water molecules in it.

MR. MELLOTT: So the physical lattice that's composed of -- are they crystals? Would that be the proper nomenclature to use for these bentonite clays?

MS. UNDERWOOD: Yes, they are mineral crystals, yes, that form clay minerals.

MR. MELLOTT: Do these crystals tend to bend when they are exposed to bionic forces and thereby expand?

MS. UNDERWOOD: It's on a molecular level pretty much.

MR. MELLOTT: Right, that's what I'm speaking of, the lattice of the molecular level of these bentonite clays.

MS. UNDERWOOD: Yes, I mean -- yes.

MR. MELLOTT: Okay, so what creates the ionic force? Where would that come from in these ionic -- or rather, these bentonite clays, these clays that are so important to the functionality of the landfill?

MR. UNDERWOOD: The clay minerals themselves are a charge to them. So based on the molecular structure of the clays there is a charge associated with the clay minerals.

MR. MELLOTT: One of the things I noticed in the manufacturer's literature for these geosynthetic materials, these clay liners, was that it was not a good thing for the overburden to be made of limestone, and that was explained because of the -- I believe it was a calcium ion that comes from the limestone. Would that be perhaps one of the reasons of why the ionic activity between the bentonites, the crystal structure and the calcium ions from limestone, would that perhaps be why they would rather have you not put down limestone over top of these synthetic fabrics?

MS. UNDERWOOD: I'm not sure exactly what you're talking about, because overburden by definition can't be limestone.

MR. MELLOTT: Exactly. That's what I have read is that the overburden is not supposed to be limestone because it has a detrimental effect on the clay, that it tends to reduce the ability of that ionic process to operate it. Is that your understanding as well? This is what I gleaned from the literature.

MS. UNDERWOOD: Overburden cannot be limestone. They're two different physical things. So you can't have overburden that's limestone.

MR. MELLOTT: But why is that?

MS. UNDERWOOD: Because limestone is rock and overburden is not.

MR. MELLOTT: Okay. I think that's an explanation at a macrolevel, but maybe we should just leave it at that.

So the hydration or the dehydration of clays in general, and in particular the bentonite clays, the ones that expand greatly when hydrated, that's a big deal in landfill construction, is it not?

MS. UNDERWOOD: Well, expansive clays are not used in the construction. Bentonite -- I'm not sure what type of clays, but the way you're describing it it sounds like a different type of material than bentonite.

MR. MELLOTT: Well, my understanding from the literature is that these geosynthetic fabrics that are frequently used in the construction of the trench or the cell are a layer of the bentonite or montmorillonite clay in between two sheets of a hydrocarbon polymer, and I think you mentioned before HDPE, that would be high density polyethylene, and that these clays are put there because they swell when they get wet. Would that be true?

MS. UNDERWOOD: Yes. And I just want to clarify. The HDPE is a different liner. The geosynthetic fabrics that contain a layer of bentonite to make a bentonite map are two different types of materials. So there's geotextile fabric and there's HDPE liner.

MR. MELLOTT: What would the geotextile fabric be made of? The fabric itself, not the inner lined bentonite layer .

MS. UNDERWOOD: I'm not sure what the

fabric is.

MR. MELLOTT: Would it be a polymer of some sort, a hydrocarbon?

MS. UNDERWOOD: Yes.

MR. MELLOTT: Okay. Thank you. So my interest in this is because of the gas permeability, to get back to that. And to get back to the information that I gleaned from some of the more recent research into burying radioactive waste and gas diffusion, gas transmission and so on I found in the process that the hydration or dehydration of these expanding clays is not a very consistent process. They found apparently that when they are hydrated in a dehydrated -- the homogeneity of the process is not always very good, and therefore there are apparently parts or locations across the area where the gas permeability tends to be higher than lower.

Now, I'm trying to apply this from that research to the proposed expansion. I'd like to try and understand in my mind more about the possible transmission of methane or hydrogen sulfide through the actual barrier, whether it be a clay -- natural clay layer or whether it be one of these geosynthetic fabrics that's laid down.

It concerns me that there perhaps could be a lack of homogeneity and it concerns me that there could be on a dehydration and rehydration cycle a possibility for dislocations or greater permeability through that. Would that be of concern to you, something along that line?

MS. UNDERWOOD: No, and the reason it would not be are these: One is you have the HDPE liner which is different than the clays that you're talking about, so that isn't even subjected to the conditions that you're describing; secondly, inside the landfill the moisture content is high, so it's not subject to wetting and drying cycles as you're describing. And so for those reasons it would not be a concern.

MR. MELLOTT: Now, as you move up in elevation away from the surrounding grade what happens to the water table or the moisture content of the earth or whatever material is there?

MS. UNDERWOOD: As you get above the water table the moisture content would go down.

MR. MELLOTT: This landfill was just described as being up to 113 feet in height above the surrounding grade. What happens to the hydration of the materials as it moves up in elevation?

MS. UNDERWOOD: There would be a different moisture content at the top of the landfill than there would be at the bottom.

MR. MELLOTT: So these clays, whether it be used in a geosynthetic fabric or whether it be a natural layer put down by equipment, that could have different moisture content as they go further up in elevation as compared to at the base of the landfill; would that be true?

MS. UNDERWOOD: To some extent. Although, remember that the waste is encapsulated by the HDPE liner. And so it would be like saying you put moist air into a balloon, you might see a little bit of difference in the moisture content of that air inside the balloon but it's wet air. So inside the landfill it's going to be the same thing, it's -- within a liner system it's going to be moist and that moisture is going to be throughout that landfill.

MR. MELLOTT: But the moisture level could be different from the base up to the top, the 113 feet?

MS. UNDERWOOD: There would be some differences, yes.

MR. MELLOTT: And the clay moisture levels could be different from the base to the top; would that be correct?

MS. UNDERWOOD: Not to the extent where you're going to be drying out the clay, because you have a moist environment. So the issues that you're bringing up occur when you don't have moisture available. Everybody has seen when mud dries on a hot sunny day over time that it cracks. Those aren't the conditions that you have inside the landfill.

MR. MELLOTT: I'm not speaking of cracks, I'm speaking of the absolute moisture concentration as part of the matrix -- the molecular matrix of those clays. And from the correlations I have seen in the literature the permeability, the gas permeability in particular, is dependent on the amount of hydration in these bentonite clays. It's also apparently dependent on the ionic concentration in the following surroundings of those various kinds of expanding or expandable and flexible plates.

If that literature is correct and if the landfill as it moves up in elevation and further away from the groundwater and if all these things merge, would that not then perhaps allow greater gas permeability according to the hydration of those clays?

MS. UNDERWOOD: The conditions that you're talking about, the moisture content of the bentonite mat, which is inside the HDPE, it is true that if the bentonite mat is completely saturated it would have a different gas permeability than if it wasn't completely saturated. But, again, you're not relying on that to sustain the gas. You're relying on the HDPE liner system and the gas extraction system to make sure that you maintain movement of gases towards those wells and you don't have the issue that you're discussing.

MR. MELLOTT: To your analogy of your balloon, we have all bought helium balloons at the local store or as a kid. I guess lately they're mylar, which has a less permeability than the old balloons that we used to use that were possibly latex.

Have you ever seen a balloon that didn't come back down eventually? You know, if we blow up a balloon does it stay the same size forever?

MS. UNDERWOOD: Well, no, it does not.

MR. MELLOTT: Whether it's our air from our mouth, which is 78 percent nitrogen, or whether it's helium from a tank, the balloon does eventually reduce in size as helium comes down. Point being that these are permeable, they're gas permeable.

And so the high density polyethylene liner is gas permeable. It's a question of how much permeability it has -- gas permeability I'm speaking about, not water. So these issues are a concern to me because hydrogen sulfide, in particular, and even methane are significant gases to be concerned about. And it seems to me from my understanding of the construction of the landfill that there could be issues relating to the release or the transport of these gases in the engineered systems. And I have not found much literature that speaks to gas permeability. So that's something that I am concerned about, and thank you for your testimony on that issue.

MS. UNDERWOOD: I think there's not much literature because it's not an issue. There's other mechanisms that are of more concern and have been studied because there is the concern, as opposed to the gas permeability issue.

MR. MELLOTT: On another but maybe related issue, you had mentioned that there was some contamination at one section, I think it was along the drainage ditch if I recall. And the constituents -- there were more than one, but one of the constituents was benzine; is that correct?

MS. UNDERWOOD: Yes.

MR. MELLOTT: Do you know what the permissible exposure level is for benzine?

MS. UNDERWOOD: In water I think it's five parts per billion.

MR. MELLOTT: And straight benzine, 100

percent benzine, do you have any idea what that might be?

MS. UNDERWOOD: You can't have 100 percent benzine. There is --

MR. MELLOTT: Well, chemically pure, if you went to a chemistry laboratory and worked with benzine what would be the count for that particular molecule?

MS. UNDERWOOD: I'd have to look that up.

MR. MELLOTT: When I worked with it it was 10 parts per million when I first started working work with it, and it was reduced over a period of years down to -- the last time I knew it it was down to 1 part per million for an 8-hour time of average exposure of benzine.

Do you know -- you had mentioned that this contamination was benzine -- one of the constituents was benzine. Are you familiar with the components of gasoline?

MS. UNDERWOOD: Yes.

MR. MELLOTT: Does gasoline contain benzine?

MS. UNDERWOOD: Yes.

MR. MELLOTT: At what level?

MS. UNDERWOOD: I don't know.

MR. MELLOTT: Okay. Well, I'm familiar by experience with gasoline, and gasoline used to contain a much higher level of benzine than it does now. Over the years it's been reduced consistently by the EPA, by OSHA, by all the regulatory agencies. As the carcinogenic properties of benzine become better understood they continue to reduce the permissible exposure level.

My point being that benzine was once upon a time touched by practically every person in the population when they pumped gasoline into their cars and perhaps spilled a little bit on their hands or inhaled some of the vapors.

In the same sense that benzine has been -- the exposure level -- the permitted exposure level has been reduced over time I would suggest that perhaps hydrogen sulfide -- although it has not been a problem until now and has perhaps not been detected or even looked for until now -- might perhaps be beginning to be a more insistent issue.

Historically speaking -- you have been in this business for quite some time and look at a number of different constituents -- have you seen a trend like this with various constituents that they are at one point in time allowed to be exposed to the population at some level and then over time not allowed or reduced -- the exposure levels have been reduced? Is this something that you have seen in your career?

MS. UNDERWOOD: Yes, there's been some reductions in recommended levels over time for different constituents.

MR. MELLOTT: Do you think then that it would be wise to detect -- to look for lower concentrations of gases like hydrogen sulfide?

MS. UNDERWOOD: Lower concentrations where?

MR. MELLOTT: Well, wherever it's generated. In this particular case in landfills. Do you believe that it would be appropriate or smart, you know, for us as a population, as a society to look for and measure routinely hydrogen sulfide, you know, as a potential hazard to the population?

MS. UNDERWOOD: Sampling of hydrogen

sulfide can detect levels on that part per billion range already.

MR. MELLOTT: Yes, but you stated that, you know, it hasn't been done because it hasn't been seen as a problem. I'm asking do you think that perhaps it could become a problem, and therefore would it be smart to look at this, to watch for it, to detect it routinely just as we do right now in groundwater?

MS. UNDERWOOD: Where it's monitored it's detected at whatever levels are there. I'm sorry, I don't understand the question.

MR. MELLOTT: All right. Is hydrogen sulfide soluble in water?

MS. UNDERWOOD: I don't remember the solubility, but to some extent it would be.

MR. MELLOTT: According to the ATSDR, do you know whether methane is soluble in water?

MS. UNDERWOOD: Sir, they all have some solubility in water.

MR. MELLOTT: Okay. I read that methane is soluble in water to a ratio to about 2.9. So that many units of methane could be dissolved into one unit of the water. So it is apparently quite easily dissolved in water.

That being the case then, I'm concerned about -- as you were explaining to us earlier the directions that the water flows and so on, I'm concerned about in particular the groundwater and the potential for the groundwater to pick up either methane or hydrogen sulfide.

In any of your testing and design of groundwater monitoring systems have you been concerned about the solubility limits or the possibility of the dissolution of these two gases into the groundwater?

MS. UNDERWOOD: No, and the reason being, for methane to become dissolved into the groundwater you have to have some force that causes it to get into the groundwater, because it doesn't want to go there naturally. It -- you have to push it essentially into the water system. And so you typically don't ever see those types of concentrations in groundwater and it's not monitored as a normal constituent concerning groundwater.

MR. MELLOTT: So you think then that the

transport mechanism for methane would not likely be in the groundwater?

MS. UNDERWOOD: That's correct. The pathway that it wants to go through is that unsaturated soil zone.

MR. MELLOTT: Okay, and the interesting schematics that you showed us about the various layers of various kinds of soils, I guess most of us are more familiar with black dirt than anything else. What happens to the black dirt as far as the possibility of transporting these two gases? There's a layer of black dirt, and is it possible for either of these two gases to move through the black dirt?

MS. UNDERWOOD: Yes, but as -- as those gases move there's other reactions occurring. So I'll use my example of groundwater wells that have naturally occurring hydrogen sulfide. One of the problems with having that hydrogen sulfide in your water is when you open your tap water the hydrogen sulfide gets exposed to the air, and as soon as that happens chemical reactions start to occur. One of the things that occurs is the sulfur starts to precipitate out, it combines with iron that can naturally be dissolved in the water, and you make an iron sulfide precipitate. What that looks like to us is black staining that shows up on your sink or by your water faucets or whatever.

So for hydrogen sulfide gas or methane, you have to understand that as it moves there's things that are causing it to change in composition and to turn into something different. So that also contributes to limiting movement of these gases through the subsurface.

HEARING OFFICER MCCARTHY: Sir, we have been at this for over two hours at this point. I'm sure the court reporter would like to take a break, as probably everyone else would. Would this be a good point to stop for a little bit?

MR. MELLOTT: Okay, that would be fine.

HEARING OFFICER MCCARTHY: Let's take a 10-minute break or so.

(A recess was taken at 3:52 p.m. and proceedings resumed at 4:09 p.m.)

HEARING OFFICER MCCARTHY: Okay. Let's continue.

MR. MELLOTT: Okay. Ms. Underwood, I'd like to ask another question regarding the water wells -- the resident private water wells. This morning you had mentioned some things about the construction of those wells. There's been various questions and testimony about the monitoring results, test results data from those wells. I'd like to ask you, are you familiar with the DeKalb city water system?

MS. UNDERWOOD: No, I have not looked into the DeKalb city water system.

MR. MELLOTT: Okay. Are you familiar with the problem of the radiant in deep water well systems?

MS. UNDERWOOD: Yes.

MR. MELLOTT: All right. DeKalb has a problem with radiant, they have had in the past. And it's my understanding that their water system for the delivery of water for the City of DeKalb includes various different ways to reduce the radiant to get it down below the level of what the regulatory agencies require for safety of the public.

Are you generally aware that radiant is

typically found in deep wells and that well level?

MS. UNDERWOOD: I don't -- I'm not sure of the level that it's found at.

MR. MELLOTT: Okay. From the literature, my understanding is that radiant is sometimes found in wells that are deeper than 400 feet or so, it varies of course from one area of the country to another, from one aquifer to another. Are you familiar -- you just told me you're not familiar with DeKalb's system.

Are you aware that the reduction of radium in the final delivery of water to the tap can be solved or reduced by blending water from shallow wells?

MS. UNDERWOOD: Yes.

MR. MELLOTT: Okay. My understanding is that was one of the techniques that DeKalb considered to use. I actually don't know today whether they're using that particular technique. That's one of the ones that can be used and has been considered to be used.

Are you at all familiar with -- well, what would you consider to be the definition of a shallow residential or city water level?

MS. UNDERWOOD: Well, shallow wells in the area are getting water out of that Galena formation, so that's about 200 feet deep.

MR. MELLOTT: Okay, and at least 200 feet deep, or between zero and 200 feet deep? How do you define shallow?

MS. UNDERWOOD: Well, it depends on where the formation is located. So it varies probably, I don't know, in the area right around the landfill between 120 and 200 feet approximately.

MR. MELLOTT: Okay, so you would characterize the shallow wells between 120 to 200 feet deep typically?

MS. UNDERWOOD: I would characterize it more as wells that are in the Galena, those would be shallow wells.

MR. MELLOTT: And the Galena ranges in depths --

MS. UNDERWOOD: Generally, yes.

MR. MELLOTT: -- from place to place?

Okay, so then would it be true or would it be a possibility at least that infiltration of constituents that were not beneficial to human health into shallow wells or an aquifer that originated and is punctured by shallow wells, that could be a problem, that would be an issue to be careful about?

MS. UNDERWOOD: Would you repeat the question?

MR. MELLOTT: Sure. Let me define it more carefully. Knowing that shallow wells are used -- the water from shallow wells is used in blending deep well water to come up with a suitable final tap water, is it -- is it a concern as far as infiltration from landfills into shallow wells because of those reasons, the fact that it's used as blending water for public use of water source systems?

MS. UNDERWOOD: There would not be infiltration from the landfill into that aquifer. And as a hydrogeologist I'm concerned about protecting drinking water sources, so any drinking water source you want to protect.

MR. MELLOTT: Okay. In all the private wells that exist in the County are you aware of any of the private wells that could be shallow enough to be potentially infiltrated by any of the potential constituents that would come from, say, the Henry layer or any other of the layers that would conduct potential losses from the landfill?

MR. MORAN: Object to the form of the question. He's referencing all the wells in DeKalb County? I think that has no basis, at least in the record presented here, and no foundation for this witness to be able to address.

HEARING OFFICER MCCARTHY: Sustained.

MR. MELLOTT: I'll reform the question, if it's all right, Mr. Hearing Officer.

You mentioned this morning the possibility that some of the construction of the old wells within the zone -- the zone of concern of the landfill perhaps could have undergone degradation. Was that your testimony this morning?

MS. UNDERWOOD: No.

MR. MELLOTT: Would you read for me, please, of -- when you did mention something about the casings, you were talking about the casings of various wells and that they over time could change. Could you tell me what you said this morning?

MS. UNDERWOOD: I was talking about private wells, that one of the most common ways that private wells are impacted is from surface water runoff when over time or in old wells the surface casing hasn't been properly routed and placed, so that water can run down along the well casing into the well.

MR. MELLOTT: Okay, and I think you said something about the grouting, that wells are grouted, that the casings are grouted; is that correct? Did you say that?

MS. UNDERWOOD: Yes.

MR. MELLOTT: All right. Do you know whether there are any residential -- private residential wells in -- well, I'll make it specific, in the vicinity of the landfill that may not be grouted -- where the casings may not have been grouted when they were installed?

MR. MORAN: Objection, relevance.

HEARING OFFICER MCCARTHY: Define vicinity.

MR. MELLOTT: Vicinity within the siting application criterion, which I believe is a half mile; is that correct?

That's what I'm looking at, what I'm asking about, are there wells -- could there be wells within the criterion vicinity regarding this siting application where the wells perhaps were not grouted.

MR. MORAN: And I'll renew my objection. Whether wells are or are not properly grouted within a half a mile, within a mile, within 10 feet of the landfill boundary has no relevance whatsoever to an establishment by this witness as to the testimony she gave on Criterion 2.

HEARING OFFICER MCCARTHY: How is it relevant, sir?

MR. MELLOTT: I believe it's relevant because of the potential for groundwater to move potential constituents and contamination into those wells depending on the construction of those wells.

HEARING OFFICER MCCARTHY: You can answer if you know, Ms. Underwood.

MS. UNDERWOOD: I don't know.

MR. MELLOTT: Okay, so as the representative for Waste Management that would be knowledgeable to some degree about the construction of those wells within the area considered by the siting application, you don't know whether they are potentially at risk?

MR. MORAN: Objection, it's argumentative and it mischaracterizes Ms. Underwood's position.

HEARING OFFICER MCCARTHY: Sustained.

MR. MELLOTT: All right. I'll move on to another issue.

You testified this morning that testing was done on a quarterly basis, is that true, of those monitoring wells and your detection methods?

MS. UNDERWOOD: Yes.

MR. MELLOTT: Okay. I believe you also testified that potentially the contamination that was found along the union ditch that that could have been the result of either burning or flooding; is that correct?

MS. UNDERWOOD: I indicated burning or

dredging.

MR. MELLOTT: Burning or dredging?

MS. UNDERWOOD: Yes.

MR. MELLOTT: There was not a point in which flooding was considered as a possibility?

MS. UNDERWOOD: I received a question related to that, and there could be some possibility that flooding could have moved some of the sediments from one side of the creek to the other, but it's not through groundwater.

MR. MELLOTT: Could it be that with the quarterly testing if the testing were done at a point during the year when there was no chance for floods that there might be a missed opportunity for detecting some constituent?

MS. UNDERWOOD: The sampling is done during nonflood periods. I don't know any time that any of the sampling was done when there was flooding.

MR. MELLOTT: So then if there was a flood and if the flood happened to be the mechanism whereby some contaminant was detected, whether the contaminate was short-lived enough to not make it to the next quarterly sampling period, could that detection have then been missed?

MR. MORAN: Objection, calls for speculation of the type that we really shouldn't permit here.

HEARING OFFICER MCCARTHY: I agree. Sustained.

MR. MELLOTT: The testing periods, how are they determined? The time between tests, how is that determined?

MS. UNDERWOOD: By regulation.

MR. MELLOTT: Well, certainly. But what science drives the regulation to say it's got to be quarterly?

MS. UNDERWOOD: Seasonal.

MR. MELLOTT: So the seasons of the year?

MS. UNDERWOOD: Yes.

MR. MELLOTT: The metrological science, is that the science that determines how frequently testing should be done?

MS. UNDERWOOD: No, testing is desired to be done across different seasons.

MR. MELLOTT: Is there a more optimum time of season or metrological condition that you would prefer to test during?

MR. MORAN: Objection, relevance.

HEARING OFFICER MCCARTHY: Sustained.

MR. MELLOTT: So you're satisfied then with quarterly tests for those monitoring wells, you believe that that's frequent enough regardless of any sorts of ground conditions or metrological conditions?

MS. UNDERWOOD: Yes.

MR. MELLOTT: Okay. Finally, are you familiar with the building in San Francisco on San Francisco Bay called the Dakin Building?

MS. UNDERWOOD: No, I'm not.

MR. MORAN: Object.

HEARING OFFICER MCCARTHY: How is that relevant?

MR. MELLOTT: The Dakin Building is a building that was built near a landfill in San Francisco. It's a very historically significant building. It was used during the '80s as part of Glasnost. The Russian delegation visited there many times.

The significance to this hearing is that the Dakin Building has a fairly elaborate engineered system to collect and contain hydrogen sulfide. And its proximity to the landfill is what's significant and makes it relevant to this case, that's why I'm asking our expert witness whether she's familiar with that building and that engineered system.

HEARING OFFICER MCCARTHY: Okay. I'll overrule the objection, and she may answer if she knows.

MS. UNDERWOOD: I don't know.

MR. MELLOTT: Do you know of any other buildings that are proximal to landfills that have engineered systems for the collection, dispersion or prevention of hydrogen sulfide or any other gas into the building?

MS. UNDERWOOD: There's numerous old landfills where they have built structures, apartment buildings, houses, different buildings on top of old landfills and they have had to retrofit engineered systems to vent those buildings.

MR. MELLOTT: So this is an issue that is known that there can be hydrogen sulfide gas transport or other gases into buildings that are proximate to landfills and it is something then that has been considered and engineered systems have been formed to solve the issue?

MS. UNDERWOOD: Yes, but those types of landfills are not, again, the type of landfill that we're talking about. Those, uhm, situations occur on old landfills that don't have any engineered systems and generate methane is usually the concern, there's an explosive hazard, and those are the ones that have been retrofitted with those types of systems.

MR. MELLOTT: Okay. Thank you. That's all my questions.

HEARING OFFICER MCCARTHY: Okay. Anyone else have any questions of this witness?

Okay. Any redirect from Mr. Moran?

MR. MORAN: No, thank you.

HEARING OFFICER MCCARTHY: Any other questions before this witness is excused?

Okay. You may step down, Ms. Underwood.

Call your next witness, Mr. Moran.

MR. MORAN: Thank you, Mr. Hearing Officer. We'll call Mr. David Miller.

DAVID MILLER,

being first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. MORAN:

Q. Could you state your name, please, and spell your last name for us.

A. David B. Miller, M-I-L-L-E-R.

Q. Mr. Miller, what is your occupation?

A. Traffic engineer.

Q. Are you a licensed engineer?

A. Yes, I am.

Q. What states are you licensed in?

A. Illinois and Michigan.

Q. How long have you been a traffic engineer?

A. Approximately 42 years.

Q. Are you employed?

A. Yes, I am.

Q. By whom?

A. Metro Transportation Group.

Q. Okay. What is Metro Transportation Group?

A. Metro is a consulting firm that specializes in traffic engineering, transportation planning and design.

Q. Okay. What is your position with Metro?

A. I'm the CEO.

Q. How long have you been with Metro?
A. In a couple of months it will be 30 years.
Q. Now, Mr. Miller, you're here today to talk to us about Criterion 6; is that correct?
A. Yes.
Q. And that criterion involves an inquiry as to whether the traffic patterns to and from the expansion have been designed so as to minimize, not eliminate, minimize any impact on existing traffic flow; would that be correct?
A. Yes.
Q. Before we get into your evaluation let's go over your qualifications a little further. What is your education?
A. I have a Bachelor of Science in Civil Engineering and have taken traffic courses from the University of Illinois and traffic engineering.
Q. Okay. Could you describe for us now your experience in conducting traffic impact analyses.
A. Yes. As I mentioned, I have about 42 years of working on traffic studies. I have directed or managed over 1600 traffic impact studies in

Illinois, across the United States, and overseas for various types of developments, such as residential, industrial, commercial, office, sports facilities and pollution control facilities.

As part of these studies we typically will do a three-step process: the first step being a review of the existing conditions; second step is identification of the amount of new traffic that would be generated and assigning it to surrounding roadways and intersections; and lastly, to identify any improvements which may be necessary to adequately accommodate the additional site traffic.

Q. And what specifically is your experience in evaluating the traffic impact of pollution control facilities?

A. I have been involved in 19 landfills and 15 transfer stations.

Q. What was the purpose of the evaluations that you did regarding those pollution control facilities?

A. It was to evaluate the traffic impact of those facilities and to determine whether Criterion

No. 6, the determination of that was met. It was also to utilize the three-step process in evaluating those facilities.

Q. Mr. Miller, do you belong to any professional societies?

A. Yes, I do.

Q. Could you identify those for us, please.

A. Yes, I'm a fellow with the Institute of Transportation Engineers, I'm a past Illinois section president and international director with ITE, and I'm a member of both the National and Illinois Society of Professional Engineers.

MR. MORAN: Mr. Hearing Officer, may I approach the witness?

HEARING OFFICER MCCARTHY: You may.

MR. MORAN: Thank you.

(Petitioner's Exhibit No. 10 marked for identification.)

Q. Mr. Miller, I'm handing you what we have marked as Petitioner's Exhibit 10. Take a look at that, please. Do you recognize Petitioner's Exhibit 10?

A. Yes.

Q. What is it?

A. That's my resumT indicating my past experience.

Q. Okay. Does Petitioner's Exhibit 10 truly and accurately reflect your educational background, employment history and professional experience?

A. Yes, it does.

Q. Mr. Miller, is there a written report that sets out your analysis and conclusions with regard to your evaluation of Criterion 6?

A. Yes.

Q. That's contained in the siting application previously admitted as Petitioner's 1?

A. Yes, it is.

Q. I believe it's in Volume 2 of the application, correct?

A. Yes.

Q. Now, Mr. Miller, what did you do in carrying out your assignment to analyze the traffic impact of the expansion?

A. We did several things. First we looked at the collected information on the surrounding roadways, their roadway characteristics and traffic controls, and observed the traffic operations during peak and off peak times. We conducted daily and peak hour traffic counts on the surrounding roadways and intersections. We evaluated the capacity and level of service for the surrounding roadways and intersections for existing conditions. We estimated the amount of traffic that would be generated by the site for the number of trucks and other vehicles using the site, and assigned the 2013 traffic and the facility traffic to the surrounding roadways and intersections. We again evaluated the capacity and level of service for the surrounding roadway intersections for the 2013 traffic with and without the facility traffic. We conducted a gap study, which is -- we determined the frequency and durations of the breaks in the street peak hour traffic, or these gaps, at the intersection of Somonauk and the facility drive. And lastly, we looked at the intersection sight distance to make sure that that was met at the intersection of Somonauk Road and the facility drive.

Q. Mr. Miller, what are the traffic patterns for all the transfer trailers going to and from the expansion?

A. Well, as spelled out in the host agreement, the traffic patterns -- and we'll go for the traffic that is going to the site, and it is for the transfer trailers it was intended that they would all be on I-88, get off at Peace Road, head north on Peace Road to Illinois 38, take Illinois 38 to Somonauk Road and Somonauk Road to the site. And obviously the return would be that same maneuver, Somonauk Road to 38 to Peace Road south to the interchange.

That total distance is about 4.4 miles. And these are all Class 2 routes, which means that they are 80,000 pound limits, Peace Road, Route 38 and Somonauk Road down to the site drive.

Q. Mr. Miller, I'd now like to take you through each of those steps you just identified you performed in carrying out your evaluation, starting with the surrounding roadways. Can you describe those roadways for us, please?

A. Sure. The first one is Interstate 88. This is a four-lane limited access tollway. As I mentioned, there is a full interchange at Peace Road, and both of these intersections are signalized. There is a traffic signal at

Fairview Road up at Route 38. It's under the jurisdiction of Illinois State Highway authority. And because it is also a Class 2 route, it has an 80,000 pound limit.

On Peace Road, as mentioned, there is signalized intersections at both the ramps. There's an intersection at Fairview and at Illinois 38. This is a two-lane north/south arterial. It has a posted speed limit of 55 miles-an-hour north of 88 and then it does go to 45 miles-an-hour as you get to Illinois 38. It is under the jurisdiction in this area of the City of DeKalb.

Looking at Illinois Route 38, again, this is a two-lane east/west principal arterial. As I mentioned, you have the traffic signal at Peace Road. You also have a traffic signal at Somonauk Road. It is a Class 2 road, which means it has an 80,000 limit. And its jurisdiction is the Illinois Department of Transportation.

Lastly, looking at Somonauk Road, this is a two-lane north/south minor arterial. At the access drive it is under stop control. Somonauk

Road is free flow. The speed limit in this area is 55 miles-an-hour. As I mentioned earlier, this has been upgraded to an 80,000 pound limit to just south of the existing access drive. And this portion of Somonauk Road is under the jurisdiction of the DeKalb County Highway Department.

Q. You mentioned that the next step you took was to take traffic counts?

A. Yes.

Q. What types of counts?

A. We did two different kinds of counts. What we call manual counts, this is where we have an individual who's at an intersection counting all the movements, the rights, the lefts, the through traffic for all the different legs of the intersection. We counted those for a 14-hour period, from 5 a.m. to 7 p.m. and at these intersections, the two ramps to I-88 at the intersection of Peace Road and 38, and 38 to Somonauk and Somonauk at the access drive.

The second kind of count we did is what we call a mechanical count. Probably you have seen that, we have the black tube across the road.

That gives us an opportunity to get hourly and daily volumes on surrounding roads. And as shown in the purple here, we conducted mechanical counts along Peace Road and all four approaches of Peace Road and Route 38 and all four approaches of Illinois 38 and Somonauk, and then on Somonauk Road south of the site drive.

Q. And what did you find?

A. From our manual counts we found that the peak hour -- street peak hour occurred from approximately 7:15 to 8:15 in the morning and 3:30 to 4:30 in the afternoon.

For the mechanical counts we were able to get the daily volumes on these different locations. And as shown here, on Peace Road just immediately north of I-88 it's 12,800 vehicles per day. It does reduce as you get close to Route 38, it's about 11,800. On -- and then north of 38 it does jump up to 17,400. On Illinois 38, again going from west to east as can be seen, it's about 12,900, west of Peace Road it drops to 12,000, then just east of Somonauk it's at 10,700, and east of Somonauk it's at 7,500 (sic). Along Somonauk Road north of Illinois 38 we're at about 5,900, it drops to 4,900 south of Illinois 38. And then near the site it's about 3,000 vehicles per day.

Q. Now, the next step in your study was to perform a capacity analysis?

A. Yes.

Q. Could you tell us what a capacity analysis is?

A. Yes, a capacity analysis is really a way to measure the operating efficiency of either a roadway or an intersection. Typically how we do that, we will use our traffic volume counts, as we talked about, either the daily or the peak hour counts, and then combine that with the roadway intersection geometrics; and that can be how many lanes you have, the width of the lanes, percent of trucks. There's a lot of different factors that go into that.

Then it's expressed really as what we call a level of service. This is in letter grades from A through F. Kind of like in school, A is the best, F is the worst. To put it in perspective, if you have got a level of service on a roadway or an intersection that's operating at a level of service of an A or B, that's in very good operations. On a roadway if you're an A, that's basically free flow. So if you're an A or B that's good.

As you get into a C or D level you're starting to get a little more congested. At an intersection if you're at a level of service D you may occasionally get caught and miss a traffic signal cycle, you might have to wait through one.

As you get to the lower end and you're in the E to F range, this is where you're really experiencing a lot of congestion. Typically it could take you several cycle lengths. In the Chicago area this is more predominate where you have got E's and F's.

But this is really how we go and measure the operating efficiency. The Illinois Department of Transportation and in DeKalb County the minimum acceptable level of service is D.

Q. Did you perform an existing capacity analysis for the surrounding roadway segments and intersections?

A. Yes.

Q. What is the existing capacity and level of service for the roadway signals, first?

A. Okay. On the section of Peace Road between I-88 and Illinois 38 it's currently operating at about 40 percent of its capacity, which in this case is a level of service C. On the section of Illinois 38 between Peace Road and Somonauk Road it's at about 37 percent of its capacity, which is also a level of service C. On Somonauk Road south of 38 to the site drive it's only operating at about 14 percent of its capacity, and it's at a level of service A.

Q. Did you also determine the existing capacity and levels of service for the intersections during both the morning and afternoon street peak hour?

A. Correct.

Now, this is for the a.m. street peak hour. And both of the ramp terminals from I-88 and Peace Road, as can be seen, they're operating those intersections at a level of service A. And at the intersection of Peace and Route 38 that's at a level of service C. Likewise, at Route 38 and Somonauk in the a.m.

it's at a C. And then at the existing facility entrance the westbound approach to Somonauk Road is operating at a level of service B.

The p.m., fairly similar. Only changes, the westbound off ramp is at in the p.m. a B -- level service B, the eastbound is at an A. And likewise, again, at Peace and 38 and 38 and Somonauk are at a level of service C. And again, at the facility entrance it's at a level of service B in the p.m. peak hour.

Q. Let's move onto your next step, which was assigning traffic to the proposed expansion and determining the amount of traffic generated by the expansion. You made that determination as to the amount of traffic that will be generated by the expansion, correct?

A. Yes.

Q. What did you determine?

A. Well, if we look over here, looking at -- and this is trips, and I should -- a trip is a one-way movement, it's either inbound or outbound.

So if we talk about trucks, a truck can have both movements, both inbound and outbound.

So here we're talking about the total daily trip totals is 474: 237 in and 237 out. Of this 474, 354 are trucks of different types and 120 are the employee, vendors and visitors.

Now, I should point out that this number, this is the total. This includes what's occurring there right now. Actually there is about 178 trips right now, trucks and employee, vendors with the existing facility. So this is a combination of existing plus the incremental new traffic.

Now, the bar graph, the other part of this, really shows -- or tries to demonstrate how the hourly flow in traffic goes throughout the day. We looked at four different types of vehicles. In the -- I'll call it the darker green is the solid waste transfer trailers; the brownish color is the yard waste transfer trailers; this color, which I'm not sure what it is, but is collection vehicles, which is basically your rolloffs and packers; and then lastly in the blue is the employee, vendors and visitors.

What's important about this bar graph is it shows you that during the facility peak hours, when the facility has it's highest traffic, is from 9 to 10 a.m., and then the afternoon is from 1 to 2 p.m. This is 55 trips. This is 54. So they're about the same.

What's important to note is that during street peak hours, which I said earlier is 7:15 to 8:15, you can see is lower than the facility peak in the morning. Likewise, in the afternoon from 3:30 to 4:30 it's less than the afternoon peak.

So this really tries to demonstrate the vehicles coming in and out over the course of the day and kind of the relative distribution of those vehicles throughout the day.

Q. Now, Mr. Miller, you also assigned the facility traffic and the surrounding roadways and intersections --

A. Right.

Q. -- is that true?

What was included within that assignment?

A. Well, we looked at two scenarios. One was with the existing traffic and what we're calling the 2013 traffic. The reason we took 2013, this is the date that it is expected to be the opening of the facility. The second scenario was the 2009, 2013, plus the additional facility traffic.

Q. And what does the 2013 traffic include, or how did you determine that number?

A. Well, the 2013 traffic is made up of several parts. One of it is what we call the road factor, and that's taking the existing traffic and multiply it by an annual growth factor between 2009 and 2013. We utilize a 2 percent per year annual growth factor. So for four years it was 8 percent.

In reality, the traffic volumes between 2007 and 2009 have actually gone down. We have been doing traffic counts out in this area for many years, and it actually has gone down.

From 1999 to 2007 it's been growing on Illinois 38 at just under 2 percent per year. So to be conservative we assumed the 2 percent per year. As I said, in reality it's actually gone down the last two years.

The second part of the 2013 traffic was taking into account other development in the area. And we talked to the City of Cortland -- or Town of Cortland, City of DeKalb and DeKalb County to see what developments are in this area that might be built out within that period of 2013. Seven facilities were identified: two of them were up near the intersection of Peace and Route 38, and then in Cortland there was four residential developments, plus the elementary school.

Again, I think they're being very conservative there. In talking with Cortland, they had indicated they thought with the residential developments that they might even be looking at a build out of about a hundred units per year, or 400 units over a four-year period. Given the existing economy and the market that's probably unlikely, but again, to be conservative we used that. We assigned the traffic from those developments that would potentially be built out or a certain part of it be built out by 2013 and included that as the 2013 traffic.

So it really was a combination of both of those factors. So we took the existing traffic and then added on the annual growth rate of

2 percent per year plus the impact of these other developments.

Q. Let's look now at the roadway capacity at the time the expansion is expected to commence operation. What is the existing capacity on Peace Road?

A. Okay. As I mentioned before, this is currently operating at 40 percent of its capacity and a level of service C. When you add on the 2013 traffic you can see it graphically is about this amount. What happens is then the section of Peace Road goes from a level of service C to a D. Now, in reality, the existing level of service C was kind of I would call it a C minus, it was close to a level of service D, and with that additional 2013 traffic it did convert it into a level of service D.

When you add on the new facility traffic that would be on this section of Peace Road, graphically you can see it's a relatively small amount. When you went to the 2013, this went from 40 percent to 48 percent. When you add on the new facility traffic that only went to 49 percent of its capacity. So the new facility traffic basically added about 1 additional percent to the volume of the capacity of that road.

Q. And does the expansion traffic affect the level of service on Peace Road?

A. No. As shown, when you do add in the facility traffic it still remains at a level of service D.

Q. What is the existing capacity on Peace Road -- I'm sorry, not Peace Road, Illinois Route 38?

A. As mentioned earlier, this was at about 37 percent of its capacity and a level of service D. Again, when you add on the 2013 traffic this goes up to about 50 percent of its capacity, and it does change to a level of service D. When you add on the facility traffic it stays -- it adds a little bit less than 1 percent, so it's very close to 50, 51 percent. So, again, the level of service does not change when you add on the additional facility traffic.

Q. Let's move to Somonauk Road. What is the existing capacity on Somonauk?

A. This is currently at about 14 percent of its capacity and is a level of service A. When you

add on the 2013 traffic it goes to about 16 percent of its capacity and still at a level of service A. When you add on the facility traffic it goes to about 17 percent of its capacity and is still at a level of service A.
Q. So does the expansion traffic in any way affect the level of service on Somonauk Road?
A. No.
Q. So for each of the three roadways that we have just identified, does the facility traffic affect the level of service on any of those roadways?
A. No.
Q. Now, you also performed an intersection capacity analysis; is that correct?
A. Yes.
Q. You did that for both the 2013 traffic and that traffic plus the facility traffic, correct?
A. Correct.
Q. And what did you determine was the morning street peak hour?
A. Well, again, this is the a.m. street peak hour. As was shown before, both of the ramp intersections are at a level of service A; Peace

Road at 38 and 38 at Somonauk were a C; and the existing facility is at a level of service B.

When you go to add in the 2013 traffic the only change is the eastbound off/on ramp goes from a level of service A to a level of service B. The others remain the same.

And lastly, when you add in the new facility traffic as shown there's no change in the level of service at any of those intersections.

Q. And you made the same determination for the afternoon street peak hour?

A. Correct. As shown here, in the evening peak hour the two ramps, one is at A and the eastbound -- westbound off is at B; Peace Road and 38 and 38 and Somonauk are at C; and the existing facility is at a level of service B.

When you add in then the 2013 traffic, the only change is at the intersection of Peace Road and Route 38 goes from a level of service C to D. It should be noted though that that intersection right now is, again, what I would call a C minus, it's very close to a D, and with that additional 2013 traffic that was enough to convert it over to a level of service D.

Then lastly, when you add in the facility traffic there's no change in any of the surrounding intersections.

Q. The next study you did, Mr. Miller, was what you referred to as a gap study. What is a gap study?

A. A gap study is a study that determines the frequency and duration of the breaks in the through traffic of a given roadway so that to ensure that the vehicle can safely get on and off of that road. It's typically conducted during the street peak hours. And in this case we did look at the intersection of Somonauk Road and the facility access drive.

Q. What movements did you evaluate at this intersection?

A. We looked at three movements: The first one was from the facility drive heading west and turning right to go north on Somonauk Road; the second movement was heading west on the facility access drive, turning left to go south on Somonauk Road; and the third movement was heading south on Somonauk Road and turning left, or east, into the facility.

Q. Before we go any further, Mr. Miller, on this could you tell us or define for us what a gap is?

A. Yes, a gap is a measured time distance in seconds between vehicles as they pass a fixed reference point, whether they're going in one direction or the other. So as two vehicles are moving down the road and they pass this fixed reference point, it's the time difference between those two vehicles. And that's very important when we're trying to see if there's adequate gaps or breaks in the traffic, in this case on Somonauk Road to safely allow vehicles to enter or exit from Somonauk Road.

Q. And how is the number of gaps at this intersection determined?

A. Well, how we typically do that, we will utilize our laptop computer and there's a software program called TGAP. And we'll have our technician out in the field, and every time a vehicle passes that fixed reference point they will hit the key on the laptop as the vehicle is passing that reference point in one direction or another. The TGAP program then will summarize the frequency and duration of these gaps by the type, the design vehicle, and the movement that is involved. So that is how we really are able to determine is there adequate gaps for vehicles to get on and off of the road.

Q. And what were the results of the gap study you performed here?

A. Let's use the first one. Again, this is vehicles that are heading west from the facility and turning right to go onto Somonauk north.

Now, in this case the design vehicle is the semitrailer, because as I mentioned before all of the semitrailers are going to be coming via Illinois -- or Interstate 88 to Peace Road to Route 38 to Somonauk Road. So you will have semitrailers making that right turn. You will also have your collection vehicles and you will also have passenger cars. But for the purposes of this study for this movement we assumed the design vehicle to be the semitrailer.

What that means for this movement then, you need a minimum of 11 .5 seconds. In fact, that gap, the minimum gap is 11 and a half to 23 seconds, and this is defined by the Illinois Department of Transportation in their Euro Design and Engineering Manual. So that's what -- when we were looking -- so when we were counting gaps for that movement it was only gaps that were in that initial 11 and a half to 23 seconds.

We would also count other gaps that were in 11 and a half second multiples. So the next gap would be from the 23 up to 34 and a half, 34 and a half up to the 45. So what we found -- and we'll go to the a.m. peak hour, that during that morning peak hour there was 79 gaps of different times. Not all were the minimum 11 and a half to 23. There was multiple types of gaps. Of those 79 gaps, you could accommodate 241 vehicles. So if you had longer gaps obviously you can accommodate more vehicles. If you had a gap that was -- could accommodate three vehicles then that was counted in there.

So we have 79 gaps, 241 vehicles that can be accommodated. Then we compared that against the projected vehicles that are coming out of the site. This is our total site traffic. And that was -- in the morning peak hour was 18. So what you're comparing then is this is the demand, this is how many would be turning, compared to how many vehicles that could be accommodated for that movement.

Likewise, in the p.m. we had 88 gaps, 249 vehicles can be accommodated, and you compared that again with the demand of 18.

Going to the second movement, which again as I said was the -- coming from the site and turning left to go south, the same procedure in terms of gaps of vehicles can be accommodated. Now, here the design vehicle is a single unit, it's not the transfer trailers. The transfer trailers are going to be turning south on Somonauk Road. There you only need a gap of nine and a half seconds. Now, in this case there has to be a gap for both the northbound and southbound traffic on Somonauk Road.

So, again, quickly going through this, there was 120 gaps, could accommodate 256 vehicles making that maneuver. Our demand during the a.m. peak hour was only two. And likewise, in the p.m. we have 123, 255 can be accommodated, and a demand of three.

Lastly, the third movement, which was traffic southbound on Somonauk Road turning left to go into the site. This -- again, even though it's a -- the design vehicle is the semitrailer, for that movement you only need a gap of seven and a half seconds. So here we had 89 gaps but could accommodate 407 vehicles because those gaps were much longer and we were able to get more vehicles. Again, going through the exercise, 12 vehicles are heading south, turning left into the site versus 407; and in the p.m. we have 17 versus 409.

Q. The next step you took, Mr. Miller, was to perform a sight distance study. What is a sight distance study?

A. A sight distance study is a study which determines if the intersection sight distance for a given intersection is meant to ensure that a vehicle can safely -- from a side road can enter into the main road.

And so this is -- what we did was look, in this case, at Somonauk Road and the facility access drive. The design vehicle again we used was a semitrailer. And according to IDOT's manual for a semitrailer and using a design speed of 60 miles-an-hour, which is five miles-an-hour over what the posted speed limit is, you need 1,015 feet.

Now, we also used that to the south, even though realistically and as I mentioned our design vehicle was not a semitrailer, but we were being very conservative. If we only used the single unit, this number would reduce to 840.

Doing a field check of the available sight distance both coming from the site looking north and looking south so we exceed the 1,015 feet in both the northbound and southbound direction.

Q. Now, Mr. Miller, on the basis of your review would you recommend any improvements?

A. Yes.

Q. What would you recommend?

A. Well, I think as I mentioned before this -- this is showing the existing access drive into the facility. As has been discussed, this is going to be closed, and the new access drive is going to be located I believe center line to center line to about 420 feet.

The county last year did upgrade Somonauk Road to just south of this drive a couple hundred feet to a Class 2 route, which can accommodate 80,000 pounds. In order to get any of those transfer trailers down to this location you need to extend that Class 2 roadway south to this drive and actually would extend a little bit south of it.

So the first thing is to make sure that you extend the Class 2 routing and design of Somonauk Road down to the new facility access drive.

Q. Does Waste Management of Illinois, Inc. agree to implement any improvements at the facility access drive?

A. Yes. I don't know if you can see that here on this drawing, but we have also shown a separate southbound left turn lane on Somonauk Road into the site. Now, this road -- this additional left turn lane is really not warranted based on IDOT's criteria and the volumes of traffic that are on Somonauk Road. We felt that it would be desirable to add that left turn lane. It does allow those trucks, and especially these transfer trailers, to be out of the way of the southbound through traffic on Somonauk Road. So while it was not warranted, this is something that Waste Management has agreed that they would be putting that southbound left turn lane in.

Q. Does Waste Management of Illinois, Inc. agree to implement any improvements regarding signage?

A. Yes, as hopefully you can see, putting in two additional signs. These symbols indicate trucks entering highway symbols. So this would be in addition to the signs that are out there.

Actually, these two signs at the south, this really should say "End of Class 2 Truck Route", and this "Beginning of Class 2 Truck Route". But these supplemental signs representing trucks entering highway would be something that would be added both northbound and southbound on Somonauk Road.

Q. Now, Mr. Miller, based upon your expertise, experience and review of this application do you have an opinion as to whether the traffic patterns to and from the expansion have been designed so as to minimize any impact on existing traffic flow?

A. Yes, I do.

Q. What is your opinion?

A. It is my opinion that traffic patterns to and from the proposed facility have been so designed as to minimize the impact on existing traffic flows.

Q. And, Mr. Miller, what are the reasons for your opinion?

A. Well, there's several, and I have been through these before. The street peak hours do not coincide with the facility peak hours. I think that's very important. In looking at it, there's adequate roadway and intersection capacity with the 2013 traffic and with the facility traffic. As indicated, there's more than adequate gaps for those three movements, in and out of the site at Somonauk Road and the facility. There's more than adequate sight distance, both northbound and southbound at the site drive. And then the proposed improvements, we talked about the extension of the Class 2 route down to the new drive, the southbound left turn lane and the additional site.

MR. MORAN: Thank you, Mr. Miller.

No further questions, Mr. Hearing Officer.

HEARING OFFICER MCCARTHY: Thank you, Mr. Moran.

Mr. McIntyre, do you have any questions of this witness?

MR. MCINTYRE: Yes, I do. Good afternoon -- or almost evening, Mr. Miller.

CROSS-EXAMINATION

BY MR. MCINTYRE:

Q. In your testimony you said that you made Criterion 6 recommendations on 19 landfills, 15 transfer stations; is that correct?

A. Yes.

Q. Of the 19 landfills, how many of those did you recommend that it did not meet Criterion No. 6?

A. None.

Q. Of the 15 transfer stations, how many of those did not meet Criterion 6 in your opinion?

A. None.

Q. When it was put together, that Interstate 88 to Peace Road to 38, how was it determined that the trucks were going to use that -- that traffic pattern?

A. I'm not sure by what you mean by how was it determined. That was something I believe that Waste Management felt, they wanted to minimize the impact of the transfer trailers to have those vehicles on an interstate as long as they could and then to utilize Class 2 routes to get to the facility.

Q. And I guess that's why I'm asking, how are we sure they're going to use that route?

A. Well, I -- I worked with Waste Management on many projects. That's my understanding, and they have a very strict policy as it relates to especially transfer trailers obeying the routes, and they have mechanisms that if, in fact, any transfer trailer operator deviates from that or are caught by the local police or sheriff's office or whatever and they're made aware of that that they will deal with that operator. And, and as I understand it, if there's a second time that that happens they will no longer be able to bring waste to their facility. So they're very adamant. This is something that they are very clear about to make sure that there is no deviation from those routes.

Q. Are there any improvements needed on Peace Road before Route 38?

A. No. However, I didn't mention it, but at the intersection of Peace Road and Route 38, you may or may not be aware of it, there are some improvements proposed. Part of it is part of the Peace Road corridor and part of it is related to the developments at the intersection of Peace Road and 38. Basically what it is going to include is a continuation -- or a widening of Peace Road to four lanes to just south of Route 38 through the intersection and up north over the railroad tracks, I can't remember exactly where the terminance (phonetic) is. But that would be a widening of that to four lanes. And on Route 38 it would be to widen the intersections to include dual left turn lanes both eastbound and westbound.

In talking with the City, this is something they plan to do. Part of it may be timed with these developments that are occurring there. Part of the Peace Road improvement is -- further to the north is going to happen by 2013, but the actual intersection improvement of Peace

Road and 38 as far as we know is not programmed by 2013.

Q. A truck is legally able to use any Class 2 route, correct?

A. As far as I know, yes.

Q. So they could use, coming from McHenry County, Route 23 and coming up?

A. Well, as I said, this is something -- and it's in the host agreement, this is the way the transfer trailers -- this is the route they have to take, I-88 east to 38 to Somonauk Road. Deviations from that will be dealt with from Waste Management.

So theoretically could a transfer trailer be on a Class 2 route? Yes. But as part of this host agreement and part of what is being proposed here that is not the route.

Q. Well, I understand that, but it sounds to me enforcement means they have got to have violated a law, received a ticket or something and Waste Management has to be notified of that.

MR. MORAN: Objection. It's argumentative.

HEARING OFFICER MCCARTHY: Sustained.

Q. How is Waste Management to be notified they're using a different route?

A. Well, first of all, a lot of these transfer trailers are Waste Management's trucks. So they work with their own operator, their own people, so that's the majority of those.

Where they have third-party transfer trailers that is something that, as far as I know and how they have done that at others, is any operators that would be doing the transfer trailers they are made aware of that this is the designated route for access to the facility. So that is -- so they're put on notice right off the bat that this is the route.

As I said, if there is a deviation and there is somebody that violates that, Waste Management will be made aware of that and then they will deal with those operators appropriately.

Q. And my question was how would they be made aware of it?

A. Typically -- and what they try to do is to work with the local police or sheriff's department or whatever. If there's a violation and there's a ticket that's been issued for a transfer trailer that has used a route other than the designated route, what they try to do then is have the local police or sheriff's department or whoever notify that director so they're made aware of it immediately so they can deal with it immediately.

Q. So in the case of third -- a third party, the police would write a ticket and then call Waste Management?

A. I believe that's how -- how they operate on that, because they really want to work closely with the police so that if there is any violations that they're made aware of that as soon as possible.

Q. When you did the -- your study, did it involve accident -- areas where high accidents would occur?

A. Yes, we did, and it was included in our report. We looked at, again, those three routes and we looked at the intersections of -- at I-88 and the ramps at Peace Road and 38, 38 and Somonauk, and Somonauk and the access drive. The accidents over a three-year period -- I think the latest information we were able to get was from 2005 to 2007, so there's a couple year delay.

There were accidents at some of those intersections. I think the key thing was -- two key points. At the access drive and Somonauk Road, at least for that three-year time period, there was not one accident. And likewise, there was no fatalities that we were made aware of.

So yes, you're going to have accidents at some of these intersections and also along the roadways. But this is something we did include in our report, the types of accidents that occurred both on the roadways and the intersections.

Q. I'm wondering if we could get one of the pictures that has the routes?

A. Sure. Bruce.

MR. MCINTYRE: And I think the least Waste Management could do is give Bruce a raise.

MR. MILLER: I already mentioned that earlier.

UNIDENTIFIED SPEAKER: That's on the record.

MR. MCINTYRE: Does Counsel find that argumentative?

MR. MORAN: Not in the least.

MR. CAMPBELL: We'll stipulate to it.

Q. (BY MR. MCINTYRE) Just as a long-time DeKalb resident, that stretch of Route 38 going east there's been some awful accidents on that road involving fatalities, especially that little bit of an S curve past Peace Road.

A. Up in here?

Q. Yes. And do your reports reflect that?

A. Well, as I mentioned -- again, this is from 2005 to 2007 -- there were no fatal accidents reported in any of the intersections in the time period studied. That was at key intersections. It did not indicate whether there was any fatalities on the roadways themselves. So if there was something that was not in one of those intersections, I don't know if that showed up.

Q. No, they didn't occur at the intersection.

In your testimony you said that the transfer trailers go south on Somonauk?

A. I don't think I said that. I hope I didn't.

HEARING OFFICER MCCARTHY: I think at one point he may have misstated and said south.

MR. MILLER: Okay.

HEARING OFFICER MCCARTHY: I think he clearly meant north.

A. Yes, the route, as I indicated before, is from either the east or the west on I-88, north on Peace Road, east on Illinois 38 and then -- maybe I said south on Somonauk Road from 38 to the site.

Q. When they exit?

A. When they exit then they make a right turn, go north on Somonauk Road, go west on 38 to Peace Road, and then go south on Peace Road to I-88. That is the defined route for transfer trailers as defined in the host agreement.

Q. Can we see the diagram with the improvements?

A. Yes.

Q. There -- you are making improvements to make Somonauk a Class 2 route for a short section south of the facility access drive --

A. Correct.

Q. -- correct?

And for what purpose?

A. Well, it's so we can basically accommodate the transfer trailers south to this drive. Transfer trailers --

Q. South of that?

A. To this drive.

Q. South of that drive. You're not making any improvements there?

A. No. No.

MR. STODDARD: South of the existing.

A. I mean actually, as you can see here, when we widen this to create the left turn lane we do have some additional widening, and then this tapers back to the existing two lane section south of this drive. But in terms of the 80,000 pound load limit, that's really just going to the -- extending it south to the facility access drive.

MR. MCINTYRE: That's all I have.

HEARING OFFICER MCCARTHY: Mr. Campbell.

MR. CAMPBELL: Good afternoon, Mr. Miller -- good evening. I just have a few questions.

Could we have the big map up that shows 88, Peace Road? I think it was the first one you put up there.

CROSS-EXAMINATION

BY MR. CAMPBELL:

Q. Sir, in looking at this particular diagram Fairview Drive kind of jumps right out at me as being a connector between Peace Road and Somonauk. And I have a feeling I know what you're going to say, but what is the class of weight of that particular road?

A. It's not a Class 2.

Q. Okay.

A. I'm not sure exactly what it is, but it's not a Class 2.

Q. I figured that. So knowing that, it obviously seems to me that would get us between two points in a lot straighter line. Was that a part of your analysis at all in suggesting to Waste Management what it would take to, you know, upgrade that to Class 2 and upgrade those intersections and try it that way?

A. I'm not sure if we specifically talked about that. While it is a little bit longer to go up to 38 and over to Somonauk Road distance wise, it was felt that -- and this was its purpose, was to keep it on existing Class 2 route.

Q. So you were given a specific route and you did your analysis based on that route?
A. And the counts and everything we did were based on that.
Q. And the only reason I'm asking is I have driven Fairview a lot and there's hardly any traffic on Fairview, and I have driven that 38 stretch a lot and that's a pretty busy road.

So to answer my question though, Fairview wasn't considered in this thing because you already knew it wasn't a Class 2, but more importantly Waste Management gave you the route to analyze and that's what you did?
A. That's correct.
Q. Sir, when you talk about -- when you get to this Criterion 6 it talks about minimizing the disruption to local traffic, and it's your expert opinion that the plan that you have suggested here that Waste Management's wanting to implement that it does minimize disruption. Does the definition -- when you talk about minimizing disruption to local traffic, sir, does that take into account noise at all? Do you get into any of those --

A. Not normally.

Q. Okay.

A. Usually it's traffic volume.

Q. Traffic?

A. Capacity.

Q. Just traffic?

A. Yeah.

Q. So emissions, what the trucks would emit in terms of -- that's also not part of your analysis?

A. No.

Q. And I think Mr. McIntyre asked you, but you were able to give us an extrapolation up to 2013, kind of give us an idea where traffic might be then. Were you able to extrapolate taking the incidents of accidents along this route, we have had trucks driving on it, we know what the traffic is, were you able to do the same type of geometrics into the future on accidents?

A. With accidents it's very difficult. There's so many factors that come into that, and that's not something that you can just -- as easily as you can do with traffic volumes that you can say there's five accidents now, given X amount of traffic that will go to eight or 10 or something like that.

Q. As an expert in this field would you understand why citizens would wonder what affect increased truck traffic of this magnitude might have on that particular statistic?

A. That's -- that can be a consideration, yes.

Q. Finally, and I think I know what you're going to say, was that affect on the road surfaces by this additional traffic and the additional weight of these trucks, was that part of the calculation that went into reaching your conclusion that there would be a minimal disruption to local traffic?

A. That's part of it.

Q. Okay.

A. And actually what happened on Somonauk Road last year when they upgraded that and were talking about extending that, it's to have facilities that are adequate to accommodate that. So that's the key to keeping it all Class 2 routes, not only for the weight limit but to make sure that they're structurally sound enough that they can accommodate truck traffic.

Q. When you increase the truck traffic and you're on a Class 2 route -- in other words, the trucks are driving lawfully on the roads that they're supposed to be driving on, does that increased truck traffic and the weight of those trucks does that diminish the life of the surfaces of those roads? It seems to me -- and again, I'm a layperson, you're the expert, but it would seem to me that the heavier the traffic and the more traffic the more likely it would be that those roads would have to be repaired more frequently.

A. To a certain extent. It really -- there's, again, a lot of factors that go into it, what is the volume of truck traffic. Actually, when you design a roadway that's taken into account. What is the estimated amount of truck traffic, the depth of the road and everything is taken into that.

What happens, probably I think more of a problem with the truck traffic, is at intersections where you get the trucks that are stopping and sometimes you'll get the wavy part of the roadways, especially if it's asphalt close to an intersection. So, yes, there can be some impact on that.

But, again, these are State routes, these are county routes and these are a city route. And try to take that into account, the truck traffic we're talking about in my opinion is nonsufficient that it is going to create the kind of deterioration that maybe you're talking about.

Q. I just have one more question. Clearly you guys have this down to a science, I'm impressed with it. The question I have is, is there any sort of attempt made by professionals like yourselves to talk to people that are actually living in these areas? In other words, on paper -- having driven, like Mr. McIntyre, this whole area for 25 years it sure seems like it looks like a lot more efficient on a schematic than it might in reality. Is there any type of human input you get from people? You know, we had a guy the other day talk about living on 38 and the truck traffic and he seemed pretty angry about the trucks going by. Is there any sort of input that you guys have figured out how to express in a study like this?

A. Well, that's a tough one. I go to a lot of meetings, and most people they don't want any additional traffic.

Q. Sure.

A. So you're always starting at ground zero and going from there. What we try to do is put things in perspective. You have X amount of traffic now, what is that going to add to.

As an example, if I was to put this in perspective if we looked at this, and as I said, the traffic we're talking about isn't all new traffic, we do have the existing landfill. We looked at what is the percent increase in traffic on Peace Road, on 38 and on Somonauk with that incremental increased traffic.

And to put it in perspective, on Peace Road we're adding on a daily basis just about 1 percent; on Route 38 between Peace Road and Somonauk we're adding about 1.2 percent; and on Somonauk Road, which is where everything kind of collects into that, I believe we're adding about 5.4 percent.

So you can talk about numbers and things, but you need to sometimes try to put it in perspective of what does that really mean in combination with existing traffic.

Q. And you can appreciate though that even though it's 1 percent, if it's 1 percent of real big trucks it seems like it's just a lot of difference of a route you might drive. For instance, I have a lot of friends who live in Sandwich, they come up Somonauk every day and go right by that facility.

That would be my only point that I would make, that life on the ground on this route will be different, you would admit, with this additional truck traffic?

A. It will be somewhat different.

MR. CAMPBELL: Sure. Thank you, sir.

I don't have any further questions.

HEARING OFFICER MCCARTHY: Mr. Steimel.

CROSS-EXAMINATION

BY MR. R. STEIMEL:

Q. Good afternoon.

A. Good afternoon.

Q. I'm interested in your definition of capacity. You said they have 50 percent of capacity. What is a hundred percent of capacity?

A. If the road is operating at a hundred percent of its capacity it's basically what we would call forced flow and that is --

Q. -- bumper to bumper?

A. Pretty much.

Q. Some standstill maybe?

A. Some intersections in Chicago are like that.

It's really a way of trying to evaluate how congested this road is, and so it's rare that you get to a hundred percent of capacity. Usually if you can, by the time you're getting close to that you're trying to do some improvement that will increase that capacity. But I'm sure there's some facilities that are operating at or near capacity.

Q. So if 38 was rated at 50 percent capacity, how -- what is the distance between the cars, how many vehicles, say, per minute are traveling that road --

A. Uhm --

Q. -- in one direction?

A. Right now there's about 12,000 vehicles in both directions so just split that in half, it's not necessarily that way, but say like 6,000 in each direction. That's over a 24-hour period. There do tend to be -- I do have -- it's easier to deal with peak hours because if you can make the traffic work in the peak hours then the other times work too.

Q. I agree. What would peak numbers be?

A. Traffic on Route 38, and this would be in the morning, heading eastbound east of Peace Road is 490. Heading westbound in the morning as you're approaching Peace Road is 505.

Q. That is per hour?

A. That's in one hour, that's the morning peak hour.

In the evening eastbound on 38 east of Peace Road is 560, and westbound as it approaches Peace Road is 520. So two-way is about a thousand vehicles during peak hour.

Q. Do you consider a difference between semis and cars when you consider the traffic count?

A. That's taken into account when we do the capacity analysis, yes.

Q. But I guess is there a difference -- you consider there is a difference between a semi and a car?

A. Yes.

Q. And --

A. When we do the roadway capacity, as I mentioned, you take the volumes and then the geometrics, and into that is the width of the roads, how many lanes you have, percent of trucks. There's several factors that go into that. So two roads that can be handling exactly the same amount of traffic may have different capacities just because, one, they have narrower widths or a higher percent of truck traffic or whatever. So yes, we do take that into account in both the roadway capacity and the intersection capacity.

Q. In your travel pattern you have left-hand turns at Somonauk onto 38 and on 38 onto Peace?

A. Right.

Q. Left-hand turns with semis, does that create more of an obstruction than you would have otherwise?

A. Well, again, we take that into account when we're doing the capacity. So we have that percent of trucks that are making that maneuver, so it is accommodated when we do an intersection capacity, that movement. It isn't just the total vehicles, it is what percent of those are trucks, so that is taken into account.

Q. You gave us a lot of figures, and I'm not sure if you gave us the figure on the number of new traffic vehicles.

A. Yes.

Q. Did you give us that? You gave a chart there with in and outs.

A. Let me do this so we're real clear with this. With the existing facility right now there's -- and these are trips, again a trip is a one-way movement. So with the existing facility there's 84 trips, which is a combination of packers and rolloffs; there's 30 trips, which is yard waste; and there's 64 trips that are employees, vendors and visitors; for a total of 178.

With the new facility there will now be 224 collection vehicles, packers and rolloffs; there will be a hundred transfer trailer trips, taking the trucks in and out; the yard waste will stay the same , so there's still 30 trips for yard waste; and the employees, vendors and visitors goes up, there's 120; so that's 474.

Q. Do you have those figures that were on the screen that you can flash up for us?

MR. STODDARD: That's the facility trip generation.

A. It was the total there, and then we had the bar graph that showed that --

Q. Not -- you had current, but did you have new then?

A. We didn't have the incremental. We had the total. We had the 474 number, which is this here. The difference between the existing, which is 178 trips, and the new, which includes the existing, which is 474, that difference is 296 trips over a 13-hour period.

Q. Okay. That's the number I was wondering. With the 1700 tons of garbage per day increase how many semis will that be? Do you have that?

A. Yes. Currently they're -- the only transfer trailers going into the site are yard waste, and that's 10 trips a day, and that will stay the same at the new facility. The new facility there will be a hundred trips of transfer trailers, 50 in, 50 out.

Q. A hundred trips?
A. Yes.
Q. 50 in, 50 out. 50 new transfer trucks?
A. Yes. Over actually -- the transfer trailers I think is over an 11-hour period.
Q. If we're bringing in 1700 tons of garbage a day new -- what is the capacity of a transfer trailer? How many tons?
A. Well, it isn't just the transfer trailers that are going to bring in that additional. As I mentioned, there's 140 additional trips for rolloffs and packers. But I can give you that information.

On average, and again this can vary, transfer trailer, the average load is 22 tons; for a packer average load is 8 tons; and for a rolloff the average load is 4 tons. Now, that can go -- depending on the weight or what type of material will go in there, you can have a full truck and it's all paper or something, that might be lighter or heavier, depending on what it is.
Q. I'll admit I'm not very good at math, but 22 tons per truck, 1700 tons per day --

A. That would be about 80 trucks.

Q. About 80 trucks.

A. But as I said, not all of that is transfer trailers. So you have got 50 trucks that are transfer trailers, and then about 60 -- 60 trucks that are packers and rolloffs but they hold a smaller amount than transfer trailers, so it's the combination.

Q. Will they be carrying new garbage also? Will they be coming from out of county?

A. Yes, so that's that additional -- 84 trips are in there now. With the new facility it will be 224. So there's 140 -- there's 140 new trips coming from the packers and rolloffs that are coming into the site.

Q. Okay. That's the number that we wanted.

Left-handed turns at intersections, semis, cuts down your line of vision. I know, I drove -- I drive through Peace and Fairview all the time. A lot of semis turning and that's -- it's a dangerous intersection.

Anyway, let's move on. Sight lines, you gave a figure there, the inter -- the entrance there to the landfill, is there any unusual features there?

A. Well, obviously to the north you have got the road goes up over I-88, and obviously that was one of the reasons in terms of relocating the drive further south so that the sight distance would be greater.

Q. You say that a sight distance is required of a 1,015 feet?

A. For a semi at the design speed of 60 miles-an-hour.

Q. And what would be the -- what is the existing sight line?

A. Well, I don't know the exact one, but it's in excess of 1,015. We have people who sit there who actually do sight distance measurements all the time, so this is something that was very important to ensure that we do not have any potential problems. So that was something that we deal very commonly with. That was actually in excess of what was required.

Q. South of the entrance is there any road feature there that is abnormal? If you drove that road or were at that site you'd notice it right away. There's an S curve there?

A. Yes.
Q. Is that S curve represented on your drawings?
A. I'm not seeing it.
Q. There is.
A. When we do --
Q. Another safety factor of concern.
A. When we do our sight distance analysis if there's a horizontal or a vertical curve that's taken into account, it's how far can you see a vehicle from either direction from that point at a height of I think it's four and a half feet, which would be equivalent to sitting in a car. So if, in fact, there is a horizontal curve or whatever, as long as somebody has a sight that they can see that vehicle then that's something that we take into account.
Q. How wide is Somonauk Road?
A. The new section?
Q. Yes.
A. As far as I know it's at least 24 feet.
Q. What kind of a shoulder do we have on Somonauk?
A. I believe it's a gravel shoulder.
Q. What's the shape of the shoulder, the width of the shoulder, do you have any idea?

A. I would just be speculating from driving that, I would say it's less than 8 feet.

Q. It sure is. The only reason I know, I live just north of the tollway on Somonauk Road. 4 inches of blacktop was put on the road, a little gravel was put on the shoulder. We got very steep shoulders there. We need that addressed. It's a safety issue.

Have you figured in your traffic studies the movement of farm equipment on county roads?

A. Indirectly. We -- when we did our counts, which was last April or May, I do not recall if we had farm vehicles. We have worked on other projects of Waste Management's where we did counts in the fall and did add that into account.

So we do understand, especially in sites that are out in more rural areas, that especially in the fall you can have some of those type of vehicles. Fortunately it's not a year round thing, but it is something that we are aware of the potential for those kinds of vehicles. It's not a whole lot different than any -- you know, than the other vehicles, the trucks or whatever that are on that road have to deal with that. So it's something that is there and we are aware of that.

Q. Farm vehicle equipment is usually 15 feet, thereabouts. Very steep shoulder that was just manufactured this fall, this summer. I watch a lot of farm traffic go past. The biggest danger is when you have to meet a semi. There just isn't room for both. The farm tractor has to pull off of the road. The shoulder is very steep. We got a safety issue here. The last thing we want to see there is more semis.

What can we do to improve that situation?

A. Well, I guess the -- to upgrade the shoulders. That is a DeKalb County road. They just did the upgrading last year. I guess there could be some discussion with the County regarding what can be done with the shoulders. It's unfortunate, they just did upgrade that road, that that wasn't taken into account. But I'm not familiar with what all went into that other than they did upgrade that to a Class 2 route.

Q. Do you feel Waste Management would have any share in that cost?

A. We have talked to the County, they're going to be extending a Class 2, putting in a left turn lane, which at least addresses some of your issues right at the site drive. So we are at least getting semis out of the flow of the southbound through traffic. So it will be wider at that point and it will be less of an issue or a problem in that immediate area where their facility is. And to that extent, I mean, that's a commitment that they have made and that will be part of this and put in prior to any opening of the facility.

What can be done about the shoulders, I'm not a hundred percent sure. Clearly that is a DeKalb County road issue.

Q. The only reason I raise these questions is because I see it every day, and you have the sight lines you're speaking of. Traffic comes over that overpass very fast. I shudder when I see trucks stopped waiting to make a turn and that type of thing. So I would ask that --

A. That's why we felt that, even though technically with the manual we do not -- based on the lower volumes on that section of Somonauk it technically did not require a southbound left turn lane, we felt probably as you would that getting those semis and other trucks out of the through traffic in that area was important. And that's why we recommended it, and Waste Management will make that commitment to have that there.

MR. R. STEIMEL: I just raise these questions because I'm concerned about the issue, and I hope that that's given, you know, very serious attention. That's all that I have.

HEARING OFFICER MCCARTHY: Okay. It's about 20 to 6. The committee wanted to adjourn at 5:30. I guess we'll adjourn for the evening. I hate to make Mr. Miller come back, but I don't really think we have much choice. There's Dan Steimel, there's the County, there's members of the County Board, members of the public may have questions, so I think we'll adjourn now and reconvene tomorrow morning at 9 o'clock.

(The hearing recessed for the day at 5:43 p.m.)

STATE OF ILLINOIS

IN RE: THE APPLICATION	)
FOR APPROVAL OF THE DEKALB	)
COUNTY LANDFILL EXPANSION,	)
	) Kishwaukee Community College
	) DeKalb, IL
	) March 4, 2010

We, Julie K. Edeus and Callie S. Bodmer, hereby certify that we are Certified Shorthand Reporters of the State of Illinois; that we are the ones who, by order and at the direction of the Hearing Officer, JOHN J. McCARTHY, reported in shorthand the proceedings had or required to be kept in the above-entitled case; and that the above and foregoing is a full, true and complete transcript of our said shorthand notes so taken.

Dated at Dixon, Illinois, this 4th day of March, 2010.

Julie K. Edeus
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Callie S. Bodmer
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