MEETING

STATE OF CALIFORNIA

ENVIRONMENTAL PROTECTION AGENCY

AIR RESOURCES BOARD

SCIENTIFIC REVIEW PANEL

ON TOXIC AIR CONTAMINANTS

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

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JAMES F. PETERS, CSR
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A P P E A R A N C E S

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John Budroe, Ph.D., Chief, Air Toxicology and Risk Assessment Section

Albert Wang, Ph.D.

I N D E X

I N D E X C O N T I N U E D

P R O C E E D I N G S

CHAIRPERSON ANASTASIO: Okay. Good morning, everyone. I'd like to welcome you to today's Scientific Review Panel meeting. Calling the meeting to order now.

I'd like to welcome anyone who's watching us on the webcast. And we'll just do a quick introduction for the SRP -- or of the SRP members.

So I'm Cort Anastasio. I'm Chair of the Panel and professor in the Department of Land, Air and Water Resources at UC Davis.

Ahmad.

PANEL MEMBER BESARATINIA: Good morning. I'm Ahmad Besaratinia. I'm and associate professor at the Department of Preventive Medicine at USC.

PANEL MEMBER LANDOLPH: Hi. I'm Joseph Landolph. I'm an associate professor in the Department of Molecular Microbiology and Immunology in the Department of Pathology in the cancer center at the University of Southern California in Los Angeles.

PANEL MEMBER KLEINMAN: Mike Kleinman from the University of California at Irvine. I'm an inhalation toxicologist and do research on health effects of air pollution.

PANEL MEMBER BLANC: Paul Blanc, University of California, San Francisco.

PANEL MEMBER MILLER: Good morning. I'm Lisa Miller. I'm a professor at the UC Davis School of Veterinary Medicine.

CHAIRPERSON ANASTASIO: Great. Thank you, all.

Just as a note, we are missing Drs. Glantz, Hammond, and Ritz today.

A couple of administrative items. If you need a restroom or drinking fountain outside the room and to the left. If there's a fire alarm, please exit down the stairs and proceed outside the building.

Okay. And overview of the meeting today. Three agenda items. First, is -- will be -- have a presentation from OEHHA and Panel discussion on the proposed reference exposure levels for toluene.

Second, after lunch, we'll be giving -- we will be given an update on the implementation of Assembly Bill 617 and what's planned for air monitoring in the initial 10 communities that were selected under this program. And then we'll end today's meeting with an informational presentation by CARB staff about their work updating the list of chemicals whose emissions are reported on the AB 2588 Hot Spots Air Toxics Program.

The current plan is for the Panel to review this list over the next several months and then we'll give feedback to CARB at our October 4th meeting.

To end the overview with a reminder. So Jim, our intrepid court report, is not here today. So he's going to have to be transcribing this entire meeting just from the transcript -- or from the recording of this. So please when it's your turn to speak, turn on your microphone and make sure that you're speaking very clearly, so that Jim can get everything clearly.

All right. So we will move then to our first agenda item, which is the Panel review of the proposed REL for toluene. So the document that we received just from the Office of Environmental Health Hazard Assessment, it was released for public review and comment on December 1st, 2017.

And then based on the comments that OEHHA received from that version of the document, they revised it and then sent it to the Scientific Review Panel in May 2019 on May 31st. At the same time, it was posted on OEHHA's webpage for the public.

So today, what we're going to do is we'll start with a presentation from OEHHA staff on the proposed RELs for toluene, and then we'll have a Panel discussion so, that we can give feedback to OEHHA staff.

So I'm going to introduce John Budroe and then John will introduce our speaker from OEHHA.

So, John, take it away.

DR. BUDROE: Okay. For the benefit of the court reporter, my name is Dr. John Budroe. I'm Chief of OEHHA's Air Toxicology and Risk Assessment Section. And I'd like to introduce Dr. Albert Wang. He's a member of my staff and the lead author on the toluene REL document, and he'll be giving the presentation on the document today.

(Thereupon an overhead presentation was presented as follows.)

DR. WANG: Thank you, John.

Good morning.

I'm here to present OEHHA's draft reference exposure levels for toluene under the Air Toxics Hot Spots Program for the Scientific Review Panel's review.

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DR. WANG: Toluene is widely used as a solvent in paints, coatings, synthetic fragrances, adhesives, inks, and cleaning agents and it is also a gasoline constituent. It is relatively volatile and can be readily absorbed through inhalation and ingestion.

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DR. WANG: Our proposed toluene RELs, acute REL, will be based on the key study of Andersen et al., 1983. It is a human study with 16 young and healthy males as subjects. And exposure is through inhalation of ambient

air or airs with 10, 40, 100 ppm of toluene for 6 hours.

The critical effects are impaired reaction time and symptoms of headache, dizziness, feeling of intoxication, and sensory irritation of eye and nose.

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DR. WANG: Our previously established acute REL used this key study and used a time-adjusted concentration of 98 ppm, or 370 milligrams per cubic meter.

On the uncertainty factors, LOAEL uncertainty factor 1, interspecies uncertainty factor of 1, intraspecies uncertainty factor of 10, resulting in cumulative uncertainty factor of 10, and acute REL of 37,000 micrograms per cubic meter or 9,800 ppb.

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DR. WANG: In our proposed updated acute REL used the same key study with LOAEL of 100 ppm and NOAEL of 40 ppm. For time-adjusted exposure, because we are looking at the sensory irritation endpoint, so there is no time adjustment for this derivation. The exposure will be 40 ppm or 150 milligrams per cubic meter.

For uncertainty factors, since 2008, according to our new methodology, we have two components for intraspecies uncertainty factor. So here we applied a toxicokinetic component of root 10, which is default, and also a toxicodynamic component of 10 for the protection of

children.

With accumulated uncertainty factor of 30, we reach the acute REL proposed 5,000 micrograms per cubic meter or 1,300 ppb.

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DR. WANG: So compared on this slide from previous established acute REL to a proposed acute REL, we have a time-adjusted concentration from 370 microgram -- milligrams per cubic meter to 150 milligrams per cubic meter.

For uncertainty factors, we had the change of toxicodynamic component of the intraspecies uncertainty factor from root 10 to 10.

The overall uncertainty factor changed from 10 to 30 and lowered the acute REL from 37,000 micrograms per cubic meter to 5,000 micrograms per cubic meter. The basis for these changes, one, is due to the sensory -- the nature of concentration dependent for sensory irritation endpoint. So we do not apply the time adjustment.

Secondly, because we have a toxicodynamic component of 10 for greater susceptibility of children to neurotoxic effects.

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DR. WANG: On the chronic REL side, our previously established chronic REL was using a animal

study Hillefors-Berglund et al. 1995. The subjects were male rats. And it's inhalation exposure for 6-hour per day, 5 days per week, for 4 weeks. The critical effects were decreased brain weight and altered dopamine receptor binding.

With a LOAEL of 80 ppm and NOAEL of 40 ppm, the time-adjusted exposure was 7 ppm. The subchronic uncertainty factor was 10. Because this is a subchronic study, we extrapolate to chronic REL.

For interspecies uncertainty factor, we applied 1, because this study was supported by a human study. For intraspecies uncertainty factor, it's default 10. So we have a cumulative uncertainty factor of 100 and a chronic REL of 300 micrograms per cubic meter, or 70 ppb.

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DR. WANG: Now, we propose to have a new 8-hour REL and an updated chronic REL. Based on a key -- the key study of Zavalic et al. 1998. The subjects are adult workers exposed to toluene based on an occupational inhalation rate of 10 kilometers per day, 5 days a week for more than 15 years.

And the workers were evaluated on the color vision performance using a sensitive color vision testing method, Lanthony D-15 desaturated test. And the critical effect is acquired color vision impairment or called

dyschromatopsia.

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DR. WANG: And for this endpoint, dyschromatopsia is a sensitive endpoint in human. It is a color vision impairment. It reflects neural alterations in the peripheral nervous system and it can be detected before the subject aware of functional disability earlier than other endpoints.

More than 50 studies reveal that the color vision impairment from chemical exposure can be detected at low exposure levels if the color vision testing method is sensitive enough.

It seems to occur, this endpoint, can add concentrations lower than those for other human toxicity endpoints.

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DR. WANG: The study data for this key study is Zavalic et al. 1998, one group of 41 adult workers from a shoe factory were exposed to a level of toluene identified as NOAEL. The second group of 32 adult workers from a printing press were exposed to a concentration of toluene identified as LOAEL. And the third group that's 83 adult workers without exposure -- without occupational toluene exposure as a control group.

So the exposure was through inhalation.

Occupational inhalation rate is 10 cubic meters per day, for 8 hours per day, and 5 days per week. And the duration of exposure for the NOAEL group, it's average 15.6 years and for LOAEL group, it's 19.86 years.

The critical effect is acquired color vision impairment dyschromatopsia with a LOAEL of 156 ppm and a NOAEL of 35 ppm.

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DR. WANG: With a dichotomous data set provided, two exposure group and one control group, we can run a benchmark dose analysis using U.S. EPA's EMDS software with a BMDL or BMC05 as equivalent to true NOAEL.

The BMC models for the dichotomous data provided acceptable line fit. The BMCL05 value over a range of 6.9 to 32 ppm. And the Probit model provided the best fit, because it has the highest AIC number and the -- the lowest AIC number and the highest P value for goodness of fit. As a result, we have a BMCL05 from the Probit model of 11.9 ppm.

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DR. WANG: And this slide shows the line fit for this key study from benchmark dose analysis. The red line is the Probit line fit and the blue line is the BMDL lower bound, which reflects the -- at the lower end of the BMD range. As a result, we have a BMDL of 11.9 and a BMD of

16.9 ppm.

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DR. WANG: So for our proposed 8-hour REL with this key study, we have a benchmark dose of 11.9 ppm, time-adjusted exposure of 8.6 ppm with -- it is a -- with a LOAEL at 10. And it's a chronic human study. So the LOAEL uncertainty factor, subchronic uncertainty factor, and interspecies uncertainty factor are all 1.

For the intraspecies uncertainty factor, we have a toxicokinetic component of 3.9 from a PBPK modeling study for toluene. Also, we applied a toxicodynamic component of 10 for the protection of children. So with a accumulated uncertainty factor of 39, we have 8-hour REL of 830 micrograms per cubic meter or 220 ppb.

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DR. WANG: And for the proposed chronic REL, we have a similar -- we have the same key study and similar derivation. Except for time adjustment, we have 4.3 ppm. And the end result for chronic REL was 420 micrograms per cubic meter or 110 ppb.

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DR. WANG: This slide shows the changes we made from the previously established chronic REL to our proposed chronic REL. The study type changed from an animal study to a human study with the critical effects

from CNS toxicity to a more sensitive color vision impairment.

For the approach of analysis from NOAEL/LOAEL approach the BM -- to benchmark dose analysis and with a time-adjusted exposure from 30 milligrams per cubic meter to -- lowered to 16 milligrams per cubic meter. For the uncertainty factors subchronic uncertainty factor from -- lowered from 10 to 1. And for the intraspecies uncertainty factor, particularly for the toxicokinetic component from root 10 to 3.9, which was from a PBPK modeling study. Also, the toxicodynamic component from root 10 to 10 for protection of children and infants with a cumulative uncertainty factor lowered from 100 to 39, we have a little bit increase for chronic REL from 300 micrograms per cubic meter to 420 microgram per cubic meter.

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DR. WANG: Toluene is a toxic air contaminant. It was listed as a developmental toxicant in 1991 under Proposition 65 based on neonatal effects from maternal toluene abuse during pregnancy. And also other neurotoxic effects, as well as fetal toxic effects. So OEHHA had a valid concern that toluene exposure may disproportionally impact infants and children. Therefore, OEHHA recommends toluene be identified as a TAC, which may

disproportionally impact children.

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DR. WANG: And this slide summarized our proposed acute 8-hour and the chronic RELs.

DR. BUDROE: That concludes the presentation on the document itself. We also have a presentation on the response to public comments. So I'd like to ask the Chair if we should stop for questions now or proceed through with the response to comments?

CHAIRPERSON ANASTASIO: Yeah, I suggest we finish your document and then we'll go to the Panel for comments and questions.

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DR. WANG: During the public comment period, OEHHA received comments from the American Chemistry Council, ACC, Toluene and Xylene Panel. Those comments are addressed below.

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DR. WANG: Comment number 1 over sensory irritation by alkyl benzenes.

ACC states OEHHA has failed to consider large body of literature on toluene-induced sensory irritation by toluene and other alkyl benzenes.

OEHHA response is we based the propose toluene acute REL on human sensory irritation of the eyes and

nose.

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DR. WANG: Comment number 2 over the basis for reevaluation.

ACC states OEHHA is strongly encouraged to explain the basis for discounting the previously established acute REL provided in the scientific peer-reviewed literature by its own scientists.

Also, the scientific basis for reevaluating previously established RELs for toluene should be provided. Have new methods or processes been applied in the reevaluation? The reasons for the reevaluation should be clearly stated and explained in the document.

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DR. WANG: For this comment, we respond. OEHHA chose to reevaluate the previously established toluene RELs, because OEHHA was mandated to reevaluate toluene and other chemicals, having the potential to disproportionately impact the health of infants and children under the Children's Environmental Health Protection Act, SB 25. And also, new human data became available for use as the basis for the 8-hour and the chronic RELs.

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DR. WANG: In response to comments, OEHHA added

the reasons for the RELs reevaluation and the comparison between the old and new toluene RELs in the text of the draft toluene RELs document.

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DR. WANG: Comment number 3 over color blindness: transient endpoints. The basis for -- ACC states, the basis for both the 8-hour and chronic REL was color blindness. Color blindness is a transient reversible outcome that resolves after exposure is removed. It is the result of years of exposure, not a single shift, at specific concentrations. As such, applying high -- highly conservative uncertainty factor based on the reversible outcome is unsupportable.

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DR. WANG: OEHHA's response. There is evidence that exposure to toluene results in persistent effects on neurological endpoints, including color vision deficits. For example, Zavalic et al. 1998 reported that color vision scores in toluene-exposed workers on Wednesday did not differ from the scores in the same workers on Monday after at least 48 hours without exposure, suggesting that the effect was persistent.

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DR. WANG: Comment number 4 over impact analysis. ACC states OEHHA should incorporate a thoughtful impact

analysis for selection of the toluene RELs, particularly in light of the opposed DTSC regulation that appears to elevate OEHHA REL values to the level of California-applicable or relevant and appropriate requirements under multiple regulatory programs.

OEHHA's response. OEHHA is not mandated under Health and Safety Code section to -- 44360(b)(2) to provide an impact analysis of any type when developing RELs. Any questions or comments regarding the use of OEHHA REL values by other CalEPA departments should be directed to those departments.

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DR. WANG: Comment number 5 over the nature of the critical effect. For the acute inhalation REL derivation, OEHHA selected sensory irritation of the eyes and nose as the critical effect from the key study, Andersen et al. 1983. The irritation reported in the study was confined to the eyes and nose. Toluene-induced sensory irritation of the nose and eyes is clearly a portal of entry effect. Therefore, toxicokinetics likely plays no role in the induction and occurrence of this effect, and the uncertainty factor based on toxicokinetics is scientifically inappropriate and unjustified.

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DR. WANG: OEHHA's response. OEHHA agreed with

ACC that the key effect for toluene acute REL is sensory irritation, and the site of action is the point of first contact; toxicokinetics plays no role in this effect. The document was revised to apply a default of UFH-k of root 10 and the UFH-d of 10 for potential sensitive subpopulations, for example infants and children, neurotoxicity, resulting in an overall uncertainty factor of 30.

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DR. WANG: Comment number 6 over toxicokinetic variability. ACC states the overall uncertainty factor for intraspecies differences or human variability has a default value of 10. The overall UFH for human variability with a default value of 10 was split into two factors, UFH-k and UFH-d, for kinetics and dynamics respectively.

The default values for these UFs are either root 10 or 3.16 for both; alternatively, factors of 2.5 for UFH-d and 4 for UFH-k have been suggested. The overall value of 39 used by OEHHA is almost four times the default.

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DR. WANG: OEHHA's response. In response to ACC comment number 5, OEHHA changed the UFH-k present from 3.9, based on the PBPK data, to a default value of root 10

for the acute inhalation REL derivation. Use of a UFH-d of 10 to account for the potential additional susceptibility of children to the toluene-induced neurotoxicity resulted in an overall uncertainty factor of 30.

This increase in cumulative uncertainty factor over the default value was entirely appropriate given the toluene neurotoxicity data.

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DR. WANG: Comment number 7 over sensory irritation. ACC states sensory irritation of the upper respiratory tract in mice results in a decrease in respiratory rate. The POD is a 50 percent decrease or RD50. Collins et al. 2040 and Kuwabara et al. 2007 are papers written by OEHHA staff, in which the acute toluene REL of 9.8 ppm was compared to RD50 values from the mouse bioassay, suggesting the relationship of the RD50 and the REL by this equation.

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DR. WANG: Also, ACC continued uncertainty factors for human variability for sensory irritation. They list extra uncertainty factors from the literature.

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DR. WANG: OEHHA's response. Since the acute REL is based on human sensory irritation data, there is no

need to consider an animal based sensory irritation approach for deriving an acute REL.

Additionally, OEHHA policy has always preferred the use of benchmark dose approach over that of an RD50 in deriving RELs. The use of a default UFH-k of root 10 and a UFH-d of 10 for potential additional susceptibility of children to neurotoxicity resulting in a total intraspecies uncertainty factor of 30 is consistent with OEHHA methodology.

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DR. WANG: Comment number 8 over 8-hour and chronic RELs. ACC states we agree with OEHHA in using the BMD/BMC method for the 8-hour and chronic RELs, which uses the lower bound of the 95th percentile confidence limit to identify the POD. However, we disagree with the selection of the BMD05 versus BMD10 as the excess risk. U.S. EPA studies show that BMDL/BMCL10 values best correspond to a NOAEL and recommends applying the BMDL/BMCL10 values for deriving the BMC or BMD. Based on the U.S. EPA guidance, OEHHA's use of the BMC05 corresponds to a value that is about two times lower than the NOAEL. As such, the BMCL 10 is most appropriate to identify the NOAEL POD for deriving 8-hour and chronic RELs.

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DR. WANG: The comment continued. Finally, the

data showing the range of PODs identified by varying the excess risk for 1, 2.5, 5, and 10 respectively should also be presented. Given the data set used by OEHHA is based on only two groups, the BMD modeling to construct the dose response relationship for toluene and color blindness has substantial uncertainty, which is acknowledged by OEHHA, page 54, but not quantitatively adjusted.

Moreover, as seen in table 3 page 51, the BMD models are essentially the same, with nearly identical P and AIC values. OEHHA states that they used these values as the basis for model selection. Yet, they don't provide information that allows a true distinction in model fit.

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DR. WANG: OEHHA's response. OEHHA has demonstrated that the lower 95 percent confidence bound on the BMC05 typically appears equivalent to a NOAEL in well designed and conducted animal studies where a quantal measure of toxic response is reported.

Therefore, OEHHA typically use a 5 percent response rate as the default for determination of the BMC from quantal data. Thus, OEHHA does not deem it necessary to include BMC01, BMC2.5, or BMC10 modeling data in the document.

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DR. WANG: Continued. On page 54 of the public

comment toluene RELs document, the only statement involving uncertainty is a comment on U.S. EPA's RfC derivation. OEHHA does not agree with ACC's comment that the BMD modeling to construct a dose-response relationship toluene and the color blindness has substantial uncertainty, which is acknowledged by OEHHA.

OEHHA does not believe that substantial uncertainty exists in the BMD modeling presented in the document.

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DR. WANG: Comment number 5 -- number 9 over 8-hour REL only. ACC states from the draft toluene document, it is not clear to who an 8-hour REL would apply/protect and under what exposure scenario an 8-hour time period would be encountered by the general public. Conventionally, a 24-hour time period is considered more appropriate.

OEHHA's response. The 8-hour REL is meant to protect offsite workers and children in schools. The chronic noncancer health impacts on those groups have been traditionally assessed with the 24-hour chronic RELs.

Because offsite workers and children at school are generally exposed for 8 hours, the 8-hour RELs will ensure a more accurate assessment of the health impacts caused by their exposures.

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DR. WANG: This is the end of the presentation.

CHAIRPERSON ANASTASIO: Great. Thank you very much, Albert.

Are there any questions that are specific to the presentation itself before we get on to a Panel discussion of the REL document?

Seeing none.

We would then move on to the Panel discussion of the REL document. So Drs. Kleinman and Miller were the leads for this. And, Mike, would you start for us?

PANEL MEMBER KLEINMAN: Definitely. Thank you.

So I'll start out with a couple of general comments. I think that the report itself is excellent. It's generally well written. I found a few areas that I could suggest some wordsmithing. I've written those down. I'll send those to you separately. I don't want to take up a lot of time with going over nitpicky things.

I think it would be useful in the lead up to discussing the RELs to actually have a table looking at the range of LOELs and NOELs that were, you know, based on the literature that you've reviewed and then put -- that puts in context the LOEL and NOEL you choose for the final version.

Trying to go back and piece it out from looking

through the document and seeing what -- you know, which groups came up with different LOELs and whatever, I think it would be easier if there was a small table added.

With regard to the responses to the ACC, I think that it was a very thorough job of discussing the comments. And, in fact, based on some of the comments, changes were made to the original document. I think that was all, you know, great.

One thing I would add to the introduction is -- and I think it's mentioned in passing somewhere in there, but toluene is one of the most widely abused chemical substances. Glue sniffing is still a common thing with children and also adults. I think it's mentioned in the document that there was a number of incidents with pregnant women, which also led up to some of the fetotoxic effects. So I think just a sentence on that in the intro would be good.

What I'm going to do is I'll try to do this, you know, paging through the document just so you know where -- you know, where my comments are coming from. And I'll try to give you the document and the lines that I'm referring to.

A key thing -- a key item in the report is that this is toxic specifically to children. And in the -- on page 24 you have a paragraph right at the top that's

listed acute toxicity to infants and children. But the only information provided there is on fetotoxicity.

And I think it would be a good idea to also summarize the other -- the biochemical differences and things like that to support the fact that this is specifically toxic to children. So that's the whole basis for making it a toxic air contaminant. I would like that to be as strong as possible.

On page 24 and line 700, which relates to activity measurements. So looking at changes in activity in animals. And when I looked at it, and Paul might have a better take on this. But in my experience with animals, you -- you generally see a biphasic response to anything that is anesthetic. So initially at low levels during an induction of anesthesia at low levels of dose, there's a lot more activity. There's an agitation phase. And then as the dose increases to a critical level, you start to see a sedation stage.

And that is very clearly brought out in many of the studies that are mentioned in the document. And I think it would be good if we were able to have that analogy to the typical behavior of almost anything that acts as an anesthetic, which this chemical does. Because when you look at it that way, you start to see logical consistencies where a young animal might be agitated

because their metabolic rate is different than an adult.

And so it takes a while for them to build up to the sedation level. So in the examples you provide on page 24, the young animal show an initial activation or agitation and then they drop out after the end of exposure or just before their level of activity starts to drop, and then they add -- you know, they have a lower level of activity.

Whereas, the adults have a higher -- or start out at a lower level of activity and they've actually reached more of a -- you know, a sedated state. But then as they metabolize off the material, they go into the more agitated state. So those -- those discrepancies, which, you know, the way it's presented might look like, well, these are totally different and they don't make any sense actually do make some sense, if you consider the facts that adults and children have different rates of metabolism for toluene.

And maybe I'll stop there. Paul, do you agree, disagree, does it makes sense?

(Discussion without mic on.)

PANEL MEMBER KLEINMAN: Okay. And then one comment, on line 714, you mention a recovery period. I'm assuming that it's not really a recovery. It's just the 30 minutes post-exposure period. So maybe it would be

good to put that in.

So on line 816, so on page 27, there's more discussion of studies where locomotor activity is, you know, different over various expose -- you know, exposure periods. And again, these changes are consistent with the pattern of effects that you see with induction of an anesthesia. So it might be -- I don't think you have to really change anything there. But as you're thinking about what these things mean, it would be useful to, you know, keep that sort of model in mind.

And then when you look at it that way, the strain differences that you're -- you allege to genetic differences that relate to sensitivity, which is kind of a nebulous term, could now be thought of as strain differences related to metabolic differences in the strain. We know that, you know, the P450s and other molecules -- you know, or metabolizing molecules, they're different and their activities are different from strain to strain. And that would be a -- you know, a much cleaner explanation of why there are these strain differences.

The word sensitivity I mean is a good general term. But I think this is much more significant in terms of it really relates to biochemistry of the animals.

I think one of the -- you do mention that there

was a discrepancy between the CT measurements and measurements of toluene in the blood -- or rather in the brain predicted by the PBPK models. And that might be a problem because the CT relationship might not be really applicable to a response that's biphasic.

So it would depend on what part of the response and duration that you're looking at in terms of concentration versus time. So it's not surprising that the model is a better predictor, the brain -- you know, the brain toluene levels are a better predictor than the C times T relationship.

There's a mention that commercial toluene contains significant amounts of benzene. If you can come up with an actual number on commercial -- you know, the -- I think that commercial toluene, there are specifications for the upper limit of other contaminants. And it might be just useful to say that it could be up to this level.

One thing that I think is -- was a significant issue for me was there's a study, and it's on page 32 and referred to on line 1012 on. So it's a study in which a battery of neurobehavioral tests were applied to 30 female workers in an electronic assembly plant. And there were significant effects when the time-weighted average exposure was 88 ppm.

And I presume -- it's not stated here whether

that was a significant change from their pre-shift level or a significant difference from that and the control group that they had, the referents.

But later in the paragraph, you mention that the control group was actually more of a -- they actually were exposed to a 13 ppm level of toluene. So they weren't truly zero control. And I would think of this as more of an experiment in which you have a high exposure group and a low exposure group. And if you considered it that way, this would give you a LOEL of something on the order of 49 milligrams per cubic meter, which is actually lower than the LOAEL derived from the change in color vision. It might bring the REL back to where it was from the animal data, as opposed to being higher than the Chronic REL.

Excuse me?

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(Thereupon a discussion occurred off the record.)

PANEL MEMBER KLEINMAN: I couldn't make it. Could you turn your mic on?

PANEL MEMBER BLANC: Could you repeat what you just said in terms of the alternative -- make clearer to me what the alternative study and endpoint would be that you're suggesting they look at?

PANEL MEMBER KLEINMAN: The endpoints in this study. It's Foo et al. 1990 study. And they --

CHAIRPERSON ANASTASIO: Sorry, Mike, which page are you on?

PANEL MEMBER KLEINMAN: This is on page 32.

CHAIRPERSON ANASTASIO: Thank you.

PANEL MEMBER KLEINMAN: So they had 30 female workers that were exposed to toluene in an electronic assembly plant. So it starts on line 1007 on page 32. And it looks like --

CHAIRPERSON ANASTASIO: Okay. Sorry, can I interrupt for a second? So do we have two different versions of the document? Are you working on the pre- -- did OEHHA make changes to the REL document after you got comments from Mike initially?

PANEL MEMBER KLEINMAN: That could be.

DR. BUDROE: Yeah. They're running into the same issue with the copies that we have from something shifting in the page and line numbers. And I can't tell you right this second what the different -- you know, why that occurred.

CHAIRPERSON ANASTASIO: Okay.

PANEL MEMBER KLEINMAN: Yeah, I've got -- the version I've got is labeled May 2019.

DR. BUDROE: Right. The study you're talking about is on page 36 in the copy that I'm looking at.

PANEL MEMBER KLEINMAN: Okay.

DR. BUDROE: We have found that starts at line 1186.

CHAIRPERSON ANASTASIO: Thank you.

PANEL MEMBER KLEINMAN: That makes a -- but, I think that -- so this study sounded like a good study and they did have a reasonable exposure. And they had a significant response on several neurobehavioral performance measures. So there was a significant decrease in neurobehavioral performance by exposed workers for 6 out of 8 tests.

The control group, however, actually had an exposure to 13 ppm or 49 milligrams per cubic meter. And, you know, in the text it mentions this could have under -- led to an underestimate of the overall effects.

But if you look at it as that low exposure group representing, you know, a LOEL or a NOEL, then the high exposure group, you know, could be used as a referent, so at -- or, you know, could be, you know, the -- an exposure with significant effects. And the 13 ppm exposure as a LOEL or -- you know, not a NOEL but a LOEL.

DR. BUDROE: Right. So we'd have a LOEL, a NOEL, but we wouldn't have a control?

PANEL MEMBER KLEINMAN: Right. And I know it's a problem, but I think it's at least worth thinking about whether there is a way of using those data more

effectively.

PANEL MEMBER BLANC: But, Michael, there's not a lot of description of the study, but the brief summary suggests that they were doing these measurements while these people were still at work on a workday on the day of exposure. I don't know. I just -- the way those studies are usually done, that's the way --

PANEL MEMBER KLEINMAN: Well, these were workers that were exposed over a long period of time, so they had an average exposure, you know, a number of years worked, you know, 5.7 years, and the control group was exposed two and a half years.

PANEL MEMBER BLANC: No, I understand that, but you can't -- in that kind of study, you could not separate out what the acute effect was from what the chronic effect might be, because people exposed acutely to toluene could -- would be anticipated to have some abnormalities of psychological testing. So that's why I was -- you know, it would be a different story if you studied them after two weeks vacation or some situation like that.

DR. BUDROE: Or even on the weekend.

PANEL MEMBER BLANC: I suppose. That's just why I might shy away from that. Whereas, I think the point that they made in response to the critique that there is no reason to presume that a change in color vision is

reversible I think is a reasonable one. Although, I do think you could cite by analogy other organic solvents where a similar color vision impairment has been shown and seems to be a long-standing sequela of exposure, such as in trichloroethylene I believe is the sort of poster child for that.

DR. BUDROE: Okay. Well, we can certainly go back and take a second look at the Foo 1990 study and see if that -- you know, if the testing -- if testing during the workday would become a confounder.

PANEL MEMBER KLEINMAN: Thank you.

And then I have just again at -- during -- at the end of the document, there is a discussion of the case of this being toxic to children. And the -- I think the information on metabolic differences between the children and the adults should be reiterated in that final paragraph as well. I think that information should be put up there whenever we -- you know, this is brought up, because I think the fetotoxicity is really a very clear indicator, but someone could argue that it doesn't say that, you know, subsequent exposures later in life are going to have much of an effect, without, you know, discussing the metabolic differences as well.

DR. BUDROE: Well, we can certainly mention the metabolic differences. But one point that we actually

note in the non-cancer technical support document is that, in general, chemicals that are neurotoxic are considered to have a potential impact in infants and children, because they have developing nervous systems.

So what wouldn't necessarily cause a long lasting effect in an adult might cause an effect in an infant or child, because those systems are still developing, and they're still more vulnerable, let's say, to perturbation that's going to persist into adulthood.

PANEL MEMBER KLEINMAN: Thank you, John. Thank you.

That wraps it up for me.

CHAIRPERSON ANASTASIO: Great. Thank you, Mike. We now turn to Lisa.

PANEL MEMBER MILLER: Okay. I'll try to add a little bit more to Mike's comments. You actually identified a study that I think might be helpful here.

To build on the susceptibility issue, the concern that Mike brought up, we could tap into the literature a bit more to support the -- the -- lowering the RELs for infants and children.

As I went through and -- yes, you -- there aren't a lot of studies within the lifespan ranging from infancy to adolescence. The prenatal effects are petty profound, so I don't think that's problematic. And you have --

clearly have ample epidemiologic and toxicologic studies in the adults. It's the gap in between that's problematic, but that's where you need this -- need supporting data to lower these RELs.

My suggestion specifically would be to expand your discussion on the cytochrome P450 enzymes. And so when I looked at the upfront section on metabolism, there's a paragraph which specifically focused on I think it was CYP2E1. And that's one of several cytochrome P450s that are known to be developmentally regulated. I think that can get beefed up quite a bit, because we know there -- there is evidence in the literature, ample evidence, both from pediatric studies taking blood samples, as well as lab animal studies, even non-human primate studies on the developmental regulation of these P450 enzymes, systemically as well as within the respiratory tract.

And I think that actually might help build your case again for the RELs for the susceptible population. We know that specifically cytochrome P450, I believe, it's 2A1 is expressed within the respiratory tract and is developmentally regulated. And so that may be provided as additional evidence to support the susceptibility, the differential metabolism of this population, so...

DR. BUDROE: Okay. Well, we can certainly expand

the description of infant and child metabolism of toluene. But one thing to note is that where we actually increase, for example, the chronic REL from the default, we go from a root 3 to 10 for the toxicodynamic uncertainty factor in humans. And that's -- you know, so that -- we're looking at as much of toxicodynamics there which, you know, rather than -- and we don't increase the uncertainty factor for toxicokinetics. So it's really more on the TD side and less on the TK side.

PANEL MEMBER MILLER: Okay. Again, I'm -- you know, I think the more evidence that you can incorporate to emphasize the susceptibility of this population, the better, right?

DR. BUDROE: More would be better in that situation.

PANEL MEMBER MILLER: Yes. Yes. Yes. Yes.

Okay. And the other comment that I had, which, you know, Mike sort of touched on this, sex as a biological variable is a hot topic for the National Institutes of Health. This is getting drilled into all the investigators who get funded through this agency. And it struck me, as I went through the document, that in some cases, the population was exclusively male. Although, the study that Mike highlighted was exclusively females, which is actually very good.

And then I looked at the study, the Zavalic study, that was used to establish the 8-hour and the chronic reference exposure level. And it's interesting, because they started off -- I actually -- I went through the paper and the group that was assigned to the -- I guess, the lower exposure group was predominantly women.

And the group that presumably had the higher exposure level was predominantly men. And then the control group was about a third women and the rest men.

But the caveat that -- this is really unfortunate that the authors of the publication didn't include this. They removed a subset of individuals for a variety of reasons, one of which is that they had a preexisting color blindness, right? So unfortunately, they didn't define whether they took out males or females.

My point is that it's quite likely that the group that gener -- that -- for which a NOEL was established was predominantly females, and then the other group is predominantly male.

And I think it just brings to the point of there may -- it may bring -- it may allow someone to question is this a true difference due to exposure levels or is this a difference due to sex, males or females. So I think it might be helpful to just at least clarify that point -- since you don't know whether these are mostly men or women

to clarify that somewhere in the document.

I think just a sentence stating that it -- there may be sex-dependent effects on the metabolism for these different studies.

Does that make sense?

DR. BUDROE: That makes sense.

PANEL MEMBER MILLER: Yeah.

And that's where perhaps the study that Mike brought might be helpful, because it was predominantly female as opposed to many of the other studies, which were predominantly male.

That's all I have.

CHAIRPERSON ANASTASIO: Great. Thank you, Lisa.

I'd like to open it up then to the rest of the Panel for other comments.

PANEL MEMBER BESARATINIA: Just going back to what Lisa briefly touched upon. Going through the literature, there are indications that the chronic effects of toluene could be gender specific. And this document has actually highlighted it, where there have been some studies looking at the liver and kidney functions, and they clearly found opposing effects of toluene exposure in male versus female. So probably that is an area which might need a little bit of clarification.

And the second thing that I have in mind is more

of a general comment with regard to the chronic toxicity studies, particularly in occupational exposed individuals, workers who have been exposed to this chemical over the course of years, if not decades.

And some of the outcome measures in those studies are clearly age dependent, for example, impairment of vision, or loss of hearing, or effect on CNS, central nervous system. And many of the earlier studies really didn't account for the effects of aging, so it has to do mostly with the study design I'm assuming.

So that is an area I believe would help if there are some sort of additional comment included in this report with regard to those potential confounding factors.

DR. BUDROE: So a general qualifier on that occupational studies, you know, age and accounting for potential changes in response with age.

PANEL MEMBER BESARATINIA: Correct. Thanks.

CHAIRPERSON ANASTASIO: Great. Thank you, Ahmad.

Joe.

PANEL MEMBER LANDOLPH: Thank you. I read through the whole document carefully. I wanted to congratulate you. I think it's very thick and science dense, which is a compliment not a detractor. And the whole document is very strong. It's well researched. It reads well. I didn't find that many errors in it.

Occasionally, I think there word "persistent" may have been misspelled as T-a-n-t instead of T-e-n-t, my memory tells me. You might do a spell check on that.

I'm a little bit worried about the neurotoxicology issues with this, particularly the interference with the color discrimination. And I think there's a tendency on the part of some of your reviewers to kind blow this off as not an important thing. I think it may actually be damage which is then later being repaired, because the likelihood is that the toluene is physically, chemically interdicting into the lipid annulus and causing disaggregation of the membranes. And that may be repaired by replication of new membranes or by dilution of it out annuli.

So I was a little bit worried about that and maybe Paul could comment on that in more detail than I could, since it's a little far from my original area. But I thought the document was well written. I thought your answered the comments to the reviewers politely, professionally. There were times when they were trying to tell you how to do your business, which you know how to do and I'm convinced they don't know how to do. And you did well and you just deferred politely and that's fine.

And so I think you did a very good job all the way around answering your reviewer, writing the document.

It's a very professionally prepared scientific document. So I'm happy with it. It's very good.

CHAIRPERSON ANASTASIO: Thank you, Joe.

Paul.

PANEL MEMBER BLANC: Can I ask you to explain again, because it was not entirely straightforward, for the endpoint which is irritation, which presumes to happen before there's any metabolism. Is that -- is that first statement correct?

DR. BUDROE: That would be correct.

PANEL MEMBER BLANC: And the toxicokinetic portion of uncertainty has to do with not variation in the toxic mechanism and effect, but the metabolism predominantly or am I confusing that? When we talk about toxicokinetics, it has to do -- that's driven largely by variability in metabolism or is it driven by something else?

DR. BUDROE: It's primarily driven by metabolism, put there are -- I mean, if you look at the whole ADMA scheme, you know, absorption, for example, is the sum difference in how quickly airborne toluene, for example, can get in the --

PANEL MEMBER BLANC: The blood stream.

DR. BUDROE: -- the blood stream, physiological fluid even in the eyes. There's some studies out there

that say that sensory irritation by, for example, styrene is actually receptor mediated. So, you know, that's a case where metabolism may actually have a role in sensory irritation. Unfortunately, there's no study that has looked at toluene in that respect. But I guess it's saying -- you know, where you get to is we don't yet know everything that there is to know about sensory irritation.

So we can't say that there's, at this point in time, that there's absolutely, for example, no metabolism component to that effect.

PANEL MEMBER BLANC: But do you feel that there's scientific -- has OEHHA previously -- I mean, sorry -- well, yes, has OEHHA previously been explicit in saying that for irritant effects that would happen prior to any metabolism, the default metabolism variability factor would still be the square root of 10? Have you stated that as explicit policy?

DR. BUDROE: I don't know if we've, yeah, stated that explicitly, but we have done RELs that were based on sensory irritation that used that default. So I guess implicitly we've been consistently making that assumption. I don't think that we actually explicitly state it in the technical support document. I'd have to go back and double check that, but I don't believe that's the case.

PANEL MEMBER BLANC: Well, it might -- yeah, I

think you should go back and check it. And then I think you should think about language that could make that point more explicitly, such as recognizing that there's no metabolism prior. There's no obvious metabolic variation that we're invoking. We, nonetheless -- the lowest we'll ever go for a toxicokinetic variability factor is the square root of 10.

I mean, it's a pretty -- you're saying that there's a range -- a 3-fold range of uncertainty in the variable response to an irritant, even if there is no metabolism of it is what you're saying de facto, right?

DR. BUDROE: That's essentially it. So you're saying that we should explicitly address that in this document?

PANEL MEMBER BLANC: A little bit more, I guess --

DR. BUDROE: Okay.

PANEL MEMBER BLANC: -- because I read it and I was quite confused. And I was confused in your response to the critique on the same basis.

DR. BUDROE: Okay. We can clarify that in the document.

PANEL MEMBER BLANC: And then my other question is on the toxicodynamic part. And this has to do with all three acute, subacute, and chronic effects. The point

about childhood susceptibility or vulnerability is subsumed within the factor of 10, isn't that correct?

DR. BUDROE: It's -- we're applying a factor of 10 to compensate for that.

PANEL MEMBER BLANC: But you --

DR. BUDROE: The default would be root 10.

PANEL MEMBER BLANC: Would be root 10, if you had just general human, adult human, right? So in the past, you had a factor of 10, because you didn't use a default of the square root of 10.

DR. BUDROE: Well, we're explicitly going with a factor of 10 rather than root 10, because of the neurotoxicity that toluene exhibits. And it's -- you know, we've based this out of the noncancer TSD, where --

PANEL MEMBER BLANC: No. No. But I'm just saying that in your description of when we previously had -- the previously REL used a factor of 10. And in contrast this time, we're using a factor of 10. I mean, that's how the document reads. And it's a little bit confusing to the reader, or at least to this reader.

DR. BUDROE: Okay. I think that was -- our cumulative uncertainty factor was 10 and we went with 30. That's one of the subfactors, because we're also breaking out the uncertainty factors between toxico issues and dynamics.

PANEL MEMBER BLANC: Which you didn't do before?

DR. BUDROE: Right.

PANEL MEMBER BLANC: Okay. I think I have a better grasp of it now. But it wasn't completely as -- go back and just see how you're wording it. I mean, if I was confused, somebody else might be too.

DR. BUDROE: Okay. We can clarify that.

PANEL MEMBER BLANC: And then a more fundamental question I have is -- I understand the rationale for the chronic REL and the presumption that color vision deficits are not going to be a reversible effect. What is the rationale for extrapolating back to say that the same endpoint is a risk for 8 hours of exposure from a public health point of view?

And you know I'm all in favor of public health protection but I'm just trying to understand the scientific basis. Because you could as easily say that you have this 6-hour exposure that you're using for your acute REL. It's not a 1-hour exposure. You're extrapolating back to 1 hour, but not doing any time adjustment, because it's an irritant effect.

But would the same thing be true if you were going to say the 6 hours is just as good as what would happen at 8 hours? In other words, what's the rationale for using a chronic lifetime work exposure of 20 years on

average to extrapolate back to what would happen with 8 hours of exposure or what the risk is from 8 hours of exposure as compared to saying, okay, the 8-hour risk is going to be pretty equivalent to the 6-hour risk in the human study that we have?

DR. BUDROE: Well, kind of between the 8-hour REL and the chronic REL. The primary REL there is the chronic REL.

PANEL MEMBER BLANC: Right.

DR. BUDROE: And we're really developing a 24-hour long-term REL from the data, and then essentially really cutting it in half for the 8-hour REL, just based on the fact that, you know, the -- our default inspiration rate is 20 cubic meters a day, when we consider that --

PANEL MEMBER BLANC: I understand that part. But what's the biological plausibility that 24 hours of exposure would give you a deficit -- a permanent deficit in color vision?

I understand the rationale for saying chronic lifetime exposure. That's the chronic REL, right?

DR. BUDROE: Um-hmm.

PANEL MEMBER BLANC: What's the biological plausibility for assuming that target organ toxicity is applicable to 24 hours -- an isolated 24 hours of exposure, not repeated 24 hours of exposure multiple

times, which would be a chronic exposure, but just one-off 24 hours?

DR. BUDROE: Going by basic concentration by time relationship.

PANEL MEMBER BLANC: But you wouldn't make that assumption for chronic and encephalopathy, for example, would you?

DR. BUDROE: It's a hypothetical, but I would see no reason why not.

PANEL MEMBER BLANC: It was interesting, because this wasn't really an issue that explicitly the public comments brought up, I realize, but -- and you have other data that you cite in terms of other color vision studies in humans, where they looked at cross-shift changes, right, is that correct? I don't remember the studies offhand, or study, but there were -- there were multiple studies looking at color vision. Some of them were negative, but they were really studies of what happens after an 8-hour exposure, weren't they, like a cross-shift study? I could go back through these and -- did anybody else have the same read of this -- that part of the document?

DR. WANG: Yeah. They can be one and that's all.

PANEL MEMBER BLANC: Yeah. So that would -- doesn't -- I mean, that would -- that would be a

counterargument to there being an 8-hour effect.

DR. BUDROE: Okay. So you're suggesting go back and look at the -- look at cross-shift effects in the -- we could use that to enhance our explanation.

PANEL MEMBER BLANC: Well, maybe you're going to find it undermines your whole justification of it. That's what I'm worried about. I know often we say why don't you go and show that it would be very similar if you did this other analysis and to support your primary contention. But unfortunately in this case, I'm kind of wondering if on the 8-hour REL, there's a bit of a fundamental flaw in thinking about how that kind of neurotoxic effect -- that kind of permanent neurotoxic effect happens?

Because I do think you're completely solid when you responded to the comment that this is a temporary thing. And I don't think that there's any reason to presume that in the chronically exposed people.

But it could be that I'm way off base. I'd be curious what other Panel member's reaction is to this. And I understand this would be a bit of a monkey wrench, because it's something you're going to have to think about and then come back to us. It's not something -- if others also have the same concern, then we -- it would be difficult to have a contingent approval of the document, since we don't know how you're going to go on this. So it

would be important to hear what other people have to say.

PANEL MEMBER KLEINMAN: A couple of quick points. One, I went back and looked up the Foo paper and it actually was a pretty good study. The -- they started with a control group of 30 workers, selected for age. They had a -- 30 females who were in the exposed group. All the workers exposed in control were non-smokers, teetotalers, and on the day of testing they were not taking any medications.

The tests were performed -- it's a -- their work shift was 5 days a week. And so they presumably worked on Monday and Tuesday. They had their neuro tests on the morning before their shift on Wednesday or Thursday. So it's not -- there's at least a 24-hour lag after the exposures.

So it -- I think, you know, some of that information would be useful to have in the document as well. Whether, you know, it turns out that the information is useful for helping to set the RELs, I think having, you know, the idea that this is really a good study should be in there.

And the other thing Paul mentioned a question about sensitivity. And one of the articles that's cited -- or one of the studies that's cited actually contrasted so-called sensitive -- toluene-sensitive

workers versus toluene-insensitive workers. I couldn't figure out -- yeah, couldn't pull that out to find it, but it's buried in there somewhere. So that might help answer the question that Paul raised about sensitivity.

(Thereupon a discussion occurred off the record.)

PANEL MEMBER BLANC: I apologize of I used the word "sensitive. "I would -- should have used the word "susceptible". That was my intent. And actually I think the word "sensitivity" should -- if it is used in this document, be parenthetically explained that you're not invoking a sensitization mechanism in the standard biological sense of the term.

There actually is no evidence that toluene acts as a sensitizer. And the papers that you do cite about childhood asthma risk using toluene as a marker of indoor volatile hydrocarbons in no way supports an argument that toluene induces sensitization. So I think that's important to say.

But it is not -- it is not the biggest fish I have to fry. So I still want -- would like to hear what the other panelists feel about the biological plausibility that an 8-hour exposure would lead to color vision deficits that are permanent.

CHAIRPERSON ANASTASIO: Does anyone want to address Paul's point?

PANEL MEMBER LANDOLPH: Yeah. I just have a gut-level feeling - it's not an analytical feeling - that maybe we should ask you to think about adding another factor of 10 or something for protection. I'm just a little bit concerned about the neurotoxicology of toluene. And I do believe this is permanent damage, you know, the color vision. So I'm still a little bit worried about that.

Now, I was looking at the very nice diagram you put in on the metabolism of toluene. It's a very nice diagram. And I didn't see any quinones or free radicals generated. And I guess there's not much evidence that toluene does that, because it's not a leukemogen, whereas benzene is a leukemogen, closely related structural congener.

So I'm beginning to develop the hypothesis that most of this may be -- color vision deficit may be due to, you know, a physical chemical interdiction of the toluene into the lipid annulus and maybe not due to any specific metabolites. Do you have any thoughts about that? Do you think metabolism is required to cause the neurotoxicology or that it's just a lipid soluble effect of toluene?

DR. BUDROE: I don't think we have enough information to really make that call right now. I mean it's a possibility.

PANEL MEMBER LANDOLPH: Yeah.

DR. BUDROE: But, you know, it's certain -- that issue has not -- we haven't seen it raised in the literature.

CHAIRPERSON ANASTASIO: Joe, can you talk a little bit more about your thoughts on increasing the uncertainty factor, be more specific, for example, and maybe some justification for your idea?

PANEL MEMBER LANDOLPH: Just the fact that it's neurotoxic worries me, and, you know, interferes with vision. And I was a little bit chicken the last time when talked about chlorpyrifos because I was thinking about another factor of 10 there. Unfortunately, the State took it out of our hands, which was good. I think we were very protective, but I want it to be even more protective. And that gut level feeling was correct there.

And I can only give you a gut level feeling that I'm wondering if we're being health protective enough with toluene, because of this -- the neurologic effects on vision and also hearing. And maybe Paul could amplify -- add to that or help us out on that.

PANEL MEMBER BLANC: Well, I actually was satisfied enough with a factor of 10, which takes into account variability and human response and the potential childhood susceptibility, and then, you know, getting to

the level 30. That part doesn't trouble me particularly with this chemical, which is not -- which -- for which the literature indicates it's pretty substantive exposure where we've really seen effects. Certainly, the literature on in utero exposure to the effects of inhalant abuse. These are very high levels of exposure.

But I -- but -- and I don't think your trepidation about which is applicable to the chronic REL really gets back to this issue about what does it mean to be exposed for 8 hours in terms of the endpoint we're talking about in this particular case.

CHAIRPERSON ANASTASIO: So, Paul, just to try to clarify. Your point is that the 8-hour REL was derived from a chronic exposure. And you're thinking why not use the 6-hour study to derive the 8-hour REL?

PANEL MEMBER BLANC: That's certainly one option, it would seem to me, especially if -- especially if there's data that does not suggest there's a cross-shift change in color vision in toluene-exposed people. I think there was one issue whether you have people -- whether people who are already chronically exposed -- one of the papers kind of suggested that if you're already chronically exposed and then I expose you to 8 hours, you might have a cross-shift deficit of something, which isn't really the question we're asking. It's if you're naive,

what happens to you with 8 hours of exposure?

And perhaps -- now, perhaps there's data in the animal literature that would support an 8-hour visual toxicity. I don't think you could measure color vision in animal models very well. I don't even know -- how would you -- how do you measure color vision in a primate? Can you do that?

CHAIRPERSON ANASTASIO: Use your microphone, Lisa.

PANEL MEMBER MILLER: Yes. It's feasible. But obviously, you wouldn't be able to get feedback from the animals. You'd have to do a retinal scan.

PANEL MEMBER BLANC: I see, yeah.

Anyway. But if you could -- you know, if you showed that in an animal model, there was retinal toxicity in some way with an 8-hour exposure, that would, you know, lend support. I think it would probably be, a -- you know, pretty high level of exposure, if you showed that, but I'm --

DR. BUDROE: I mean, without having the study in front of me, you pretty much assume that the Zavalic study you were talking about 8-hour exposures roughly.

PANEL MEMBER BLANC: No. But you're talking about 8 hours over a lifetime -- over a lifetime career. They weren't looking at what happens to you with 8 hours

of exposure. They were looking at what happens to you with 100,000 hours of exposure or some metric like that.

I mean -- and so it's different if the endpoint is biologically plausible to a occur with 8 hours of exposure or with 30 years of exposure. So if that's the biological argument that you're making, I guess it needs to be made a little bit more explicitly in this particular -- given the endpoint that you're looking at and given the chemical we're talking about.

PANEL MEMBER BESARATINIA: Just a quick note regarding the comment that Paul is making, this argument would not be unique to this chemical per se. Any other direct acting chemical would be subject to the same argument that you are making, which is a relevant point, I assume. But what I'm wondering is what is your common practice for other chemicals of the -- either the same category or the same chemicals that have the same sort of properties?

How do you derive the 8-hour effects? Do you model like back from your long-term exposure in order to drive an 8-hour REL that you have identified for toluene?

DR. BUDROE: Well, the 8-hour REL and the chronic REL are both long-term exposure RELs.

PANEL MEMBER BESARATINIA: Correct.

DR. BUDROE: It's just that we're changing the

exposure period on the 8-hour REL essentially. It's actually not even exposure period. It's the inhalation rate, you know, because we're assuming that, you know, the average person is going to inhale 20 cubic meters a day, and that a worker over an 8-hour day is going to -- the inspiration rate is going to be 10 meters a day, because -- cubic meters a day, because, you know, they're working and they're just, you know, taking in more air as a result of their work activities.

PANEL MEMBER BESARATINIA: Well, what I'm gathering from Paul argument is that this seems to be an unprecedented case that is being applied specifically to toluene. My question is have you applied the same criteria when you were evaluating other chemicals that had the same properties, for example?

DR. BUDROE: Yes, we have.

PANEL MEMBER BESARATINIA: Okay.

PANEL MEMBER BLANC: But not the same biological endpoint?

DR. BUDROE: Right. Not specifically color vision impairment.

PANEL MEMBER BLANC: Yeah.

PANEL MEMBER KLEINMAN: One thing that strikes me is when you look at the acute REL, which is based on impaired reaction time, symptoms of headaches, that sort

of thing, so short-term irritation type effects, but that's based on a 6-hour study. It would almost make sense to use that 6-hour study as the basis of the 8-hour REL. But I know that the thought here was that the real effects start almost immediately because they're sensory.

DR. BUDROE: Right. And even the other CNS effects, that's a one -- that's a short-term exposure. You know, both the 8-hour REL and the chronic RELs are our long-term. You know, even the fact that you're only looking at -- you're trying to parse out the kind of effect in protection level you would need for an offsite worker.

You know, that's still a long-term exposure that we're considering.

PANEL MEMBER KLEINMAN: Okay.

DR. BUDROE: You know, somebody who's working at, you know, a site across the street from the facility in question for years. So it's still in general, unless there's a really specific data set that shows that we should be using that -- you know, for the 8-hour REL and a different data set for the chronic REL. We're going to use the same data set for both the chronic REL and the 8-hour REL and just adjust the concentration -- the REL concentration by the inspiration rate differences.

PANEL MEMBER KLEINMAN: Okay.

CHAIRPERSON ANASTASIO: Yes, Joe.

PANEL MEMBER LANDOLPH: Have you seen any literature on any metabolites of toluene that might cause some of the toxic effects like the white matter? I guess it's a leukoencephalopathy, or the color vision discrimination problems, or any of the other toxic effects of toluene, or was it thought mainly to be a lipid solubility effect of the toluene disaggregating the membranes?

DR. WANG: Because toluene has a lot of literature, I -- my impression, there can be some explaining what can be the mechanism of toluene's effect on the color vision, but I need to go back and find it.

PANEL MEMBER LANDOLPH: Because it looks like P450 is doing exactly what it should be doing, which is making toluene more water soluble to these benzoic acid like and hippuric acid conjugates. So it's making it more water soluble so it goes away. So that's a detoxification.

But I wondered if there were some intermediate metabolites on the way to that, which would be very reactive, like the epoxides or something like that?

Thank you.

PANEL MEMBER BLANC: So maybe I just had a fundamental misunderstanding, because I interpreted the

8-hour REL as if you measured this and you had this -- achieved this level for 8 hours, here is the toxic endpoint that would drive my regulatory approach to the chemical. And what you're saying is here is the value if you were exposed to 8 hours a day for your lifetime. Here is the endpoint we're hearing about. And I always thought that was the chronic -- what the chronic REL was. So I guess I just have a -- have had a bit of a misconception --

(Phone ringing.)

PANEL MEMBER BLANC: Sorry.

DR. WANG: Just because this REL is used on the context of air toxic hot spots, we're considering the facility emitting all the chemicals. And the chronic REL is mainly applied for the general public the residents close to the facility which is 24 hours a day and lifetime.

And the 8-hour REL we consider are the -- like another business next to the facility. In there, the workers are working 8 hours a day or a school --

PANEL MEMBER BLANC: For a lifetime.

DR. WANG: For a lifetime. For long term, yes. And then the school student, the children in the school close to the facility, they expose pretty much 8 hours. So the 8-hour REL is specifically for these two groups.

DR. BUDROE: Right. And you wouldn't assume that the workers are actually being exposed for a lifetime. I think it's -- yeah.

PANEL MEMBER BLANC: In which REL, in the 8-hour REL?

DR. BUDROE: In the 8-hour REL, when you actually wind up calculating -- using HARP software to calculate the risk levels. So we're not really assuming that the workers are being exposed for a lifetime.

PANEL MEMBER BLANC: Well, thank you for that clarification then. Then I will withdraw my concern as expressed. Yeah. You can therefore proceed with your approach. I would say that somewhere in the document -- this is an aside. I don't think I saw you mention that hippuric acid -- the hippuric acid metabolite is used in much of the world as a biological monitoring measure for toluene exposure in the workplace. We don't, in the United States. But, you know, in Europe that's how you would monitor someone's exposure.

DR. BUDROE: Okay. We can add that to the document.

PANEL MEMBER BLANC: Then another question I have for you - a very small technical one, although it has to do with route of exposure - you said that it's only modestly absorbed through the skin or -- I forget what the

adjective was that you used in the document about skin exposure. It was something less than highly exposed -- highly absorbed, or rapidly absorbed, or easily absorbed. It was some modifier like sort of absorbed, or kind of absorbed, or modestly absorbed. Slightly? Was that the word? You could look on a -- if you did a word search of your document, you would find it. And I was wondering -- A, that's not a very precise word, but I was wondering what you based that on?

And I wanted to be sure that if you looked at this chemical, let's say, in the NIOSH handbook or in the American Conference of Governmental Industrial Hygienists, this is not a chemical that has a skin notation. Because if it does, then you absolutely can't say that. I mean, that's a notation which says you have to take skin absorption very seriously, which in a typical occupational situation, you do with toluene.

And, in fact, a lot of the ways in which people are heavily overexposed is by not using appropriate skin protection. Like, they're working with toluene in hood with their hand soaking with toluene, you know, that kind of thing.

DR. BUDROE: We will go back to the document and check the source of our descriptor, and if we're --

PANEL MEMBER BLANC: And cross-check the NIOSH

handbook, if you would.

DR. BUDROE: We will do that.

CHAIRPERSON ANASTASIO: Yes, Joe.

PANEL MEMBER LANDOLPH: Well, this is just a comment in regard to a comment made a long time ago here today. One of the problems with getting the contamination of toluene with benzene, is the whole thing comes off as a fraction of petroleum called BTEX, benzene, toluene, ethylbenzene, xylene. And you're so close in molecular weight it's tough to pull them apart. So it's difficult to get toluene, you know, free of benzene without doing a lot of extra theoretical plate manipulations and stuff.

So there's always some contamination. And it -- you have to -- and the commercial grade, and then as you go up to the other grade, you have to purify it more. That's why you have problems with it.

CHAIRPERSON ANASTASIO: I'd just like to go back one more time to Joe's point -- or thought on increasing uncertainty factor. I'd like to lay that to rest, before we send OEHHA on their way. Is -- I felt that OEHHA did a good job explaining the uncertainty factors and I thought the values were appropriate. Are there other Panel members who felt that the uncertainty factors in the document were underestimated for any scientific reasons?

PANEL MEMBER BLANC: I was okay with it.

PANEL MEMBER LANDOLPH: Yeah, I can withdraw my comment based on Paul's explanation of the high doses used.

PANEL MEMBER KLEINMAN: Well, this is just sort of common to the whole thing, but having said in the document that the CT relationship doesn't hold very well when you compare to the modeled brain uptake, implicitly we're using a CT relationship when you do the time adjustment from the 8-hour exposure or the 24-hour exposure, which might provide a basis for adding at least some measure of uncertainty to the toxicokinetic factor, you know, additional uncertainty. So that would be something that, you know, might be considered.

DR. BUDROE: Well, we've already increased that over to the default by using the PBPK modeling. So, I mean, normally, it would be essentially 3, but we've raised it to 3.9.

CHAIRPERSON ANASTASIO: And YOU feel that adequately accounts for this inability for the model to capture brain toluene levels?

DR. BUDROE: We think that does a reasonable job.

CHAIRPERSON ANASTASIO: Yeah. Okay. Any other Panel comments?

If not, then I suggest -- it seems that it's a good document, as we've mentioned. And I suggest that we

take it, after revisions, and that I will just look to make sure that OEHHA has addressed the points that the Panel members have brought up, and then we'll -- I will give confirmation to OEHHA to proceed, if the Panel agrees with that.

PANEL MEMBER BLANC: Oh, yeah. Can I -- but can I just -- there was one other small issue When I read it. This is just a text for you, not necessarily to change, but just read it and make sure you're -- this is saying what you want it to say. You know, at the very beginning when you say that it's present -- toluene is present in fossil fuel -- actually, you say in petroleum, I think. And then you say and manufactured by distillation and coal tar coke operations. Some wording like that, but you used the word manufactured. Do you remember that? It's really early on in the document.

Anyway, when you get a chance, would you just go back and look at it, because I'm -- I think what you mean is it's -- it's -- it's concentrated by that. Not that you -- you're not really -- you're not chemically manufacturing it. It's not what mean, is that correct? You're not like converting benzene into toluene by the heat of coke manufacturing or is that what you mean?

DR. BUDROE: No. We'll just say produced is a better word?

PANEL MEMBER BLANC: Maybe. Yeah. Yeah. I mean, something like that. And then also was the line about how toluene is used in certain chemical processes to make benzene? Do you remember that line too? That struck me as odd, because that's not how you would make benzene. You would make toluene out of benzene by methylating it. But I was just -- kind of wondered if that was some kind of error that got picked up or introduced somewhere.

DR. BUDROE: We'll go back and check that.

PANEL MEMBER BLANC: Yeah. Anyway, assuming that they go back and do these minor things that have been alluded to, I would make a motion that the document be accepted, presuming those modest changes are made, and that the Chair, at his discretion, can review the final document to make sure they did that.

CHAIRPERSON ANASTASIO: Can I get a? Second

PANEL MEMBER LANDOLPH: (Hand raised.)

CHAIRPERSON ANASTASIO: Thank you, Joe.

All in favor of the motion?

(Hands raised.)

CHAIRPERSON ANASTASIO: All right. Let the record reflect, it was unanimous in favor.

All right. Thank you very much.

So we are now going to take a lunch break. And we get the visual Confirmation from Jim, we're going to

come back 15 minutes early?

PANEL LIAISON BEHRMANN: Sure, yes.

CHAIRPERSON ANASTASIO: Yes. Okay. So this agenda for the Panel has us reassembling at 12:30, but we're going to move that up 15 minutes. So please come back ready to go at 12:15. And then Jeremy Smith will talk to us about AB 617.

All right. Thank you very much.

(Thereupon a lunch break was taken.)

A F T E R N O O N S E S S I O N

CHAIRPERSON ANASTASIO: All right. Welcome back everyone. We're going to move on in our agenda to the next item, which is an informational update on ambient air monitoring in the implementation of AB 617. So for Panel members, you will remember we don't exactly know what our role is in 617, but that's something we are still exploring, and we will get to resolution at some point.

But in the meantime, ARB staff has been kind enough to offer to come in and give us an update on the community monitoring plans for the 10 communities that were chosen in the first round.

So I'm going to turn it over to Heather and Heather is going to introduce our speaker.

(Thereupon an overhead presentation was Presented as follows.)

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS:

Right. Thank you. So Heather Arias again from the Office of Community Air Protection. Appreciate your time today. We did have a chance to brief you a few times along the way.

It is on. Is it -- is that better?

Okay. Stand right in front of it. I've never been accused of being quiet before, so this is a first. But regardless, we've provided a few presentations along

the way on how things are progressing. If you recall, we were here in the spring talking about continued work with the SRP. And we mentioned a few things that we are working on with OEHHA, including the health risk values, addressing cumulative exposure, and tracking community health benefits. We mentioned that in our presentation to you all last time.

Just as an update for you, we are working with them on that and hope to be able to come back in the future to help with the discussions that you mentioned on how we might be able to work with you all on those components. So look forward to that in the future.

But today, my colleague Jeremy Smith here is going to give you an update specifically on what is happening in the air districts as it relates to the community monitoring. So as quick reminder, the statute requires that the air districts have launched and started their monitoring by July 1st. So literally, next week. And they are in the process of doing that. That is just for the first year.

They are also in the middle of putting together their emission reduction programs and are anticipated to provide those to their local boards in the next few months. So we can provide you an update on that in the future.

But I'll turn it over to Jeremy now, so he can give you an update on how the communities are working with the districts on monitoring.

MLD STAFF AIR POLLUTION SPECIALIST SMITH: Okay. Is that close enough?

Okay. Thank you, Heather.

Thanks.

Hi. My name is Jerry Smith and I work in the Monitoring Lab Division here at CARB. And as Heather mentioned, we're going to talk about community air monitoring as part of AB 617.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And my furst slide is actually led nicely into it. Just take -- to take a look at what the bill is mandating. And AB 617 directed CARB to select communities across the state to be selected for community air monitoring systems based on the exposure burdens for toxic air contaminants and criteria air pollutants.

And for the districts, they've been mandated to deploy community air monitoring systems by July 1, which is next week or Monday. And so this presentation will talk about what those air monitoring systems are looking like, a brief overview of what technologies and methods are being applied, and what the roles and responsibilities

are for everyone involved.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: So the timeline is one of the biggest -- if you all will forgive me, I'm just getting over a cold, so I may cough a little bit. So AB 617 went into effect in July 2017. And in September 2018, CARB selected the communities and approved the Community Air Protection Blueprint. And between September 2018 and now, July 2019, so about nine months, which is not a very ong time, the air districts had to develop and implement a monitoring plan.

The districts began working immediately, if not slightly before September 2018, to get this together. And the key to these monitoring plans is community engagement. And in some districts, the districts had to work from the ground up and to put this together. And as we're speaking today, a lot of the monitoring plans are still being drafted and still being developed ahead of the July 1st deadline.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And what are the AB 617 communities? There were 10 selected. And 9 of the 10 include an air monitoring component. And these districts range from Sacramento through the Bay Area to the San Joaquin Valley, South Coast, San Diego and

Imperial. And the diversity of these communities makes it very difficult to apply a one-size-fits-all monitoring plan.

So each one of these communities have had to develop a community-specific monitoring plan to address the concerns and needs of that community. And at CARB, we've been working to create a clear and common understanding of what a monitoring plan and the key elements of those plans are. And the goal is to develop a statewide monitoring plan that can be used by all the districts in all communities.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And so that lays into what CARB's role is, which is to develop a statewide air monitoring plan. And the air monitoring plan consists of several elements. And I'll start with the online resource center, which is on the Community Air Protection website. And it provides kind of a resource for communities and districts to look to.

And the resource center consists of several main components. And the -- one is the outline of measurement technologies, which provides a application pollutant-based focus on instrumentations and methods that can be used in community monitoring.

And within this, we outline the relative costs,

what pollutants can be measured, and the relative expertise that are needed to operate these technologies.

We also provide a outline of the current community air monitoring systems. And this consists of an interactive map that you can visit the website and figure out what community air monitoring is active in your region. And we provide background on that monitoring, what methods and technology is being used broadly, and links to either data or actions that data have led to.

And lastly, but not least, is we provide resources for community science. And this is a repository for Any resources that are available for community air monitoring. So we provide links and information as they are available.

Excuse me.

And this includes things like references to the South Coast AQMD's AQ-SPEC sent to our evaluation center or any EPA monitoring resources that are available.

But the bulk of the statewide air monitoring plan resides in the 14 elements for creating a community air monitoring plan.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And these elements were created as guidance material for -- to create a successful community air monitoring plan that are

not necessarily prescriptive, but they do provide guidance to help get to a successful monitoring plan.

And there are three main questions that the 14 elements can be broken down into. And the first is what is the reason for conducting air monitoring?

And these first five elements are really crucial at the outset of monitoring to outline everything that's going to be going on. And with community air monitoring, the first element is form community partnerships. So engage with the community and then see what their concerns are.

Next is moving to a community -- state the community-specific purpose. And this is a broad statement for the overall goal of what the air monitoring is looking to achieve.

Moving to identify scope of actions. So specific actions that the monitoring data will be applicable to. And this is a good time to state that the community air monitoring as part of AB 617 is action-driven monitoring. We'll talk a little bit more about that later.

The next element is define air monitoring objectives. This is where you dig into actual technical objectives for a monitoring plan. Items could be -- look for speciated volatile organic carbons within a community. So that's a technical objective that you can address here.

And as any good monitoring plan or study is establish the roles and responsibilities ahead of time, so that everyone knows which components they are responsible for.

The next set of elements is I think pretty straightforward from a scientific approach, which is how we actually conduct the monitoring. And this is where we get into the nuts and bolts of actual monitoring, where you define what are your data quality objectives, what monitoring methods and equipment will you use, where will the monitoring take place, what are QA/QA -- QA/QC procedures, how will you manage the date, and then how will you provide a workplan for actually conducting the measurements.

And all of these elements are related back to the first five. So methods and equipment will be chose -- will be chosen based on what your community-specific purpose and what your actions and objectives are.

The last set of elements is how will the data be used to take actions. We're coming back to the action-driven focus of this monitoring. And here, you specify the process for evaluating the effectiveness. So how do you know that your monitoring -- you've done enough monitoring that your monitoring is now complete? How will the did data be analyze and interpreted. And last, but

not least, one of the most critical elements is how will these results be communicated to the public to support action? So I've mentioned action quite a bit so far.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And so what are some examples of what action is in this -- on these contexts?

They can range from informing personal choices, so items like exercising of work or school programs, going outside during recess. They can evaluate source impacts of source attribution to look at -- to identify the source of emissions and pollutants within a community; track the progress of a community emission reductions program; or support enforcement activities, new rules, or regulations.

And each one of these actions requires a different set of data quality objectives or monitoring equipment to address these. So not all tools and technologies can be used for all of these actions, but that is why in a monitoring plan, we develop the 14 elements to help streamline that process.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: So so far I've talked about the development kind of side of things with the statewide air monitoring plans for the online resource center and the 14 elements. But it's now

July 1st essentially, and so I'm moving to the implementation phase of the air monitoring component.

And so CARB's role in the implementation moving forward is we'll be providing technical support for the ongoing monitoring studies. We're actually -- we're currently reviewing many of the monitoring plans that are being developed by the districts. Each district has a liaison from the Monitoring and Lab Division to assist in this process.

CARB is also conducting special monitoring studies that are classified as community air monitoring, but are not necessarily part of AB 617. So non-regulatory monitoring within communities. And we also are offering limited field and laboratory assistance with CARB resources as resources allow on a case-by-case basis.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And so moving now to what is the district's role. So the districts are doing a lot of the legwork in conducting the monitoring -- planning and conducting the monitoring. And the focus is on action-driven monitoring with the focus on criteria and toxic air contaminants as they relate to human health. And the districts have been working with their community steering committees to identify sources -- source concerns within each community.

And then no particular order here, these are the -- kind of the major sources that have been identified in communities across the state: ports, railyards, refineries, oil and gas extraction activities, trucks or heavy-duty vehicles and mobile sources. And then with agriculture there's agricultural burning and pesticides.

And each of these sources a certain suite of technologies or tools can be used to help address the community concerns about those sources. And I'll start just talking about the reference methods. And these are the federally -- federally -- federal reference methods and federal equivalent methods that make up a large part of our current regional air monitoring network.

And these methods are highly accurate but they can be expensive and difficult to operate. But they do form a backbone for all of the other monitoring that's going on.

Air toxics, they're traditionally, you know, sample media cartridges and canisters that are collected over several hours in a community that are then taken back to a laboratory to look at the concentrations of various toxics.

Recently, some newer technology using auto gas chromatographs, or AGCs, help with temporal resolution adding hourly type measurements to this. Mobile platforms

are discussed in, I want to say, almost all of the air district monitoring discussions. And these are vehicles equipped with instrumentation, either of higher grade or various grade of instrumentation, that travel around communities and take measurements as they're driving around. So they map out the concentrations along roadways within communities and provide snapshots of emission hot spots or elevated pollutants within the community.

Fenceline monitoring is also being addressed in AB 1647, which is going into -- 2020 is when this goes into effect. And what this is is generally used as open path technology that looks at emissions as they're leaving a facility, things like a refinery, looking for fugitive emission or leaks, and typically look for species like TACs and other VOCs.

Remote sensing technology has also been discussed in several districts. And this uses a passive measurement technique where you're looking at a variety of species, either -- it kind of goes hand-in-hand with the mobile platform and fenceline, and looks for emissions from stationary sources. And it can also be used to address individual vehicle emission plumes on the roadside.

Low cost air sensors. There's been much discussion about those recently.

Again, apologies for all the coughing here.

Low cost air sensors are unique in that they bring the cost down that allow a lot -- a lot more people to become engaged in collecting data -- air quality data. And so that allows a more saturation approach where you can put a lot of sensors in an area that gives you high spatial resolution, as well as temporal resolution. But with of the sensors the data quality can be a little more uncertain than other methods.

And so looking at the districts, there is a variety of approaches being used across all the districts.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And what I'll do here is just kind of briefly mention a little bit about each one of the districts and what they're looking at now at the early stages of deploying their monitoring.

In Imperial County, they're looking primarily in the sensor-driven focus, low-cost sensor driven focus currently with the incorporation of existing regulatory monitors and possible mobile monitoring.

San Diego is looking at mobile monitoring. I believe they've already completed or started with their mobile monitoring in their community. And they will also like incorporate regulatory monitoring as well as PMCH in looking at mobile sources.

South Coast, is using a combination of multiple sources. And that will be a trend with a lot of the districts is they're using many different sources of data and typically in a phased approach. And they will combine mobile monitoring along with stationary monitoring, low-cost sensors moving forward.

San Joaquin Valley is looking at using trailers with a variety of instrumentation located inside as well as some sensors.

Sacramento is using a combination of multiple methods, including mobile monitoring, low cost sensors, and regulatory -- expanding of regulatory monitoring.

The Bay Area, a lot of their monitoring -- their monitoring is just getting started, but they -- we do expect mobile monitoring with using low cost sensors in the saturation type approach, along with expanded regulatory monitoring.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And -- so now this is the end of kind of my overview of a lot of the technical aspects.

PANEL MEMBER BLANC: Paul Blanc here.

So no one is using distance sensoring -- distant -- distant monitoring or distant -- what's the right word, remote sensoring?

MLD STAFF AIR POLLUTION SPECIALIST SMITH: Oh, yes. In the South Coast, they are using remote sensing in the Flux and Span is one of the things that they're using.

PANEL MEMBER BLANC: And when you say that, you mean with the -- from the van?

MLD STAFF AIR POLLUTION SPECIALIST SMITH: Yeah.

PANEL MEMBER BLANC: So that's not typically what I would think of as remote sensing. So nobody is using satellite imaging or any remote sensing of that nature to your -- best of your knowledge.

MLD STAFF AIR POLLUTION SPECIALIST SMITH: To the best of my knowledge, no, but the monitoring plans are in flux. So it may be one day in the future. But as of right now, I've not heard anything.

PANEL MEMBER BLANC: Okay.

MLD STAFF AIR POLLUTION SPECIALIST SMITH: And then to kind of wrap-up, these are some of the questions that we have to the SRP looking forward.

I'll just read through them and then kind of leave them as open questions for discussion.

So the folks here are experts in air toxics and their impact on human health. And so we just want to pose a question that are there any relevant emerging toxic air contaminants that districts or communities should be aware of and thinking of as we move forward?

And an important question for any monitoring study or any measurements is what measurement density and longevity would be most useful for the goals of that project? And with AB 617, that is to adequately evaluate exposure and risk. And so the question posed is what kind of density and longevity do you see would be most useful.

And lastly, the -- I went over a bunch of different technology types and tools. And there's a wide range of them. And each of these has their associated pros, and cons, and applications. And so the question here is what monitoring data types or applications would the SRP be looking for or think would be the most useful?

And so those are just question to pose and to think about.

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MLD STAFF AIR POLLUTION SPECIALIST SMITH: And with that, I'll end and open for questions, comments, or discussion.

CHAIRPERSON ANASTASIO: Great. Thank you, Jeremy.

Panel members, any comments or questions?

PANEL MEMBER KLEINMAN: Yeah. This is, you know, a good start. You know, you've got a lot of technology. You've got a lot of capabilities. And specifically looking at, you know, the way this is coming forward, it

seems like what is first needed is a summary -- summary of what each of these areas considers. What are the -- you know, you mentioned the community's concerns that's going to drive the monitoring. Coming to us and saying are there emergency -- you know, emerging toxics? We have no idea. I mean, I could say mercury. I could say, you know, a lot of things.

But what would help us identify things would be to get these community lists of concerns consolidated. Let's see what Oakland wants versus what the L.A. ports want.

We can then look at, you know, what do we know about emissions from those things. And there's a huge amount of literature available. And then, you know, that's when you start figuring out what is the monitoring strategy. You know, Monday is, you know, doing -- you know running out Monday and deploying a bunch of samplers will, you know, undoubtedly bring in a lot of data. But it could be missing, you know, key things, because the monitoring plan isn't taking into account, you know, what is really -- what are the emissions. And I know these have been looked at.

You know, there's been modeling. There's been a lot of, you know, preparation work. But that's the part that we haven't seen yet. And, you know, the SRP can be

helpful in a lot of different ways. And one way would be to start looking at that and helping integrate you know, what are we going to do with all this data?

You know, we don't just want to have, you know, Oakland come up with a bunch of numbers and -- you know, and that will be it. Oakland is not an isolated case. They can be generalized to a lot of other activities in different ports. Now, they have their own individual -- you know, each area has, you know, different inputs from industry, from traffic, and that can all be worked in.

But somewhere along the line, there's got to be this integration step that will, you know, make -- you know, make use of all the information that's being collected. So, you know, that's my first take.

CHAIRPERSON ANASTASIO: Joe.

PANEL MEMBER LANDOLPH: Yeah, a couple of quick questions. I'm behind you obviously. How were the 10 communities selected? What were -- were strictly scientific criteria used to pick them? And what priorities were set out? How were they set out?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: SO that's a good question. When the bill was signed in 2017, we had marching orders in order to bring back by September to our Board recommendations both for communities that would be selected for the first year as well as our

blueprint document that we've previously discussed with you, that includes the criteria for the program as a whole and the 14 elements that Jeremy talked about.

As we went through that process, we did look at a lot of different data sets, including CalEnviroScreen and Health Places and a lot of the air quality data that we have. But as you can clearly imagine, even with all of those data sets, it is very clear that there are hundreds of deserving communities within the State.

So we had to take more of a qualitative type approach in order to be able to narrow that down and come forward with our recommendation to the Board. Part of that was discussed at several different Board meetings over the year. We went back to our Board pretty much quarterly to bring up various topics. They had given us direction in regards to making sure that there was regional diversity, there was source diversity, there was rural and urban communities, and that we also needed to take into account the budget, the funding that was provided.

So taking all of that into account, along with recommendations we received directly from community members and the air districts themselves, we brought forward the 10 that you see on the map that the Board then essentially selected.

PANEL MEMBER LANDOLPH: And did they use hazard ratio calculations to determine what were the greatest toxic and/or carcinogenic threats among --

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: No, we didn't go into that detail when we were doing the community selection.

PANEL MEMBER LANDOLPH: Uh-huh.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: We may moving forward. So we have talked a lot about, as we're starting to -- every year, we have to go back to our Board for additional selection. And we have talked about that during these first few years, it will probably be a lot more of this qualitative type discussion of what new sources might we need to be considering for emission reduction program? Did we cover all of the sources?

And so for an example many of the community members have said, no, you haven't. Dairies is one, in fact, that we believe is not really appropriately covered from an emission reduction program. So that's something we need to think about.

But we're going to get to the point where this qualitative conversation doesn't really help us to be able to narrow down who's next. And so we have been talking about -- and Vernon Hughes from Office of Community Air Protection, we've been discussing what are some of the

more quantitative analyses that we should be conducting to help us to figure out who are our next communities to bring forward.

So thank you for that idea, and we can follow up on it.

PANEL MEMBER LANDOLPH: Yeah. Because just off the top of my head, it would seem that one way to go about it would be to make these calculations of, you know, what's the concentration, what's the slope factor for toxicity or carcinogenesis, and how many people were affected --

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Right.

PANE MEMBER LANDOLPH: -- because that's what you want to get rid of first are the bad actors --

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Right.

PANEL MEMBER LANDOLPH: -- for toxins and carcinogens.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Right. Good point. Thank you for that.

PANEL MEMBER LANDOLPH: Thank you.

CHAIRPERSON ANASTASIO: Other questions?

PANEL MEMBER BLANC: Just a clarification. So the 10 locals selected identified within their locality,

the exposure issues they were most concerned about in the qualitative sense, like trucks or refineries that you listed, and they could list more than one?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Correct. The air districts have gone through basically a public process with their steering committees. They have provided data. It depends on where you're at. Obviously, in the Bay Area, the have CARE, and South Coast has MATES. In all cases, there is inventory data that's been provided to steering committees.

So they were provided data as well as there were some more of the qualitative discussions as to what sources the community members themselves were concerned about.

PANEL MEMBER BLANC: Right. So in terms of that list that you provided that was taking the 100 all together, where you listed trucks, and refineries, and railway yards, and ports --

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Right.

PANEL MEMBER BLANC: -- obviously, port is not an issue in the San Joaquin Valley. So I'm assuming that's specific to Long Beach and Oakland or something?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: San Diego, Long Beach, Oakland, Richmond. Shafter is a little

bit concerned about it, because of their inland port that they have in the City of Shafter and the traffic that's coming from both L.A., and Long Beach, and Oakland.

PANEL MEMBER BLANC: Well, that would be truck not port, right? That would be covered by --

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Well, they like to call themselves and inland port.

PANEL MEMBER BLANC: Okay. So can you give us a sense, since there wasn't a slide, of the 7 or 10 factors? You listed 8, I think, by memory. Do -- how much overlap is there in each place, because that would give us more a sense of where to give you the feedback on what specifically they should be looking at more closely than it might be. Do you have any sense of that? Can we assume that, except for pesticides, which is perhaps unique to the Central Valley, everybody else, almost all of them have trucks, and all of them have refineries, and --

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: They all have trucks. They all have rail. They all have off-road equipment?

PANEL MEMBER BLANC: They all have what?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Off-road equipment.

PANEL MEMBER BLANC: Off-road equipment.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: So there's always mobile sources. There'a also, in all cases, some of the more localized area sources, so, for instance, charbroilers and things like that, that we are talking about, depending where you're at.

So, in Oakland, for instance, when you look at their inventory, you know, they are concerned about charbroilers. And that pops up in Fresno as well. So those are also local sources that you would see common in all 10 of the communities.

PANEL MEMBER BLANC: So in looking back on our discussions in this group, we have frequently had discussions about the lack of robust data for some of the substances that we have addressed previously. So one of the places where your group could start would be either -- it would be laborious I suppose to look at transcripts. But if you looked at the actual substances that have had opinions from the group, from this body, I think you'll see that for many of those, the data was not robust.

So let's take diesel, which seems to be a common issue, in which we discussed at great length. And, in fact, the although there are data for diesel particulate, you know, which would basically be PM2.5 or less, in fact, there's very little robust data on the gaseous components

of diesel exhaust.

So if you're going to take -- since diesel is almost a ubiquitous concern in these communities, I think you should look closely at some of the gas components or vapor components, depending on the material, the quinones and other components of diesel would be one place. And then also it turns out that the data is not robust at all for acrolein, which is far more irritating than formaldehyde on a molar basis, and it is a universal byproduct of organic material combustion.

And in terms of the pesticides for many of the higher use pesticides, in fact, there's been no air monitoring or virtually no air monitoring. And that includes breakdown products of some of the common herbicide type materials.

So those would just be some places I would say are kind of obvious to start with in terms of what hasn't -- for which the -- both the hot spots monitoring data are very, very spotty, and the Department of Pesticide Regulation data are abysmal, unless I'm misremembering all of our discussions of these materials. So maybe somebody else wants to chime in on my institutional memory here.

And I also, by the way, think you should interview a few people who have had long histories of

association with the Scientific Review Panel, even if they're not currently on the Review Panel. I think Dr. John Froines would have a few things to say to you on this topic, for example.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Thank you.

PANEL MEMBER BESARATINIA: Yeah. I'm just wondering if there is any existing community engagement and outreach plans that is accessible to those 10 communities or future communities that might potentially benefit from such programs. Like one of the goals here is to provide resources to communities and scientists. So are they there that such resources exist here? And what are the eligibility criteria? If they would like to take advantage of what are the selection criteria, for example, if it is a grant mechanism, who is eligible, who is not, and what are the priorities? Is there some information in the public domain or even in the website?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Yeah, that's a great question. Certainly, we're always trying to do a better job of reaching out and figuring out how to make sure that we reach all the different communities. And in this first year, we've actually learned quite a bit about that. And the community members themselves have been very helpful in

teaching both us and the air districts on better ways to reach out to community members, and make sure that the information that Jeremy mentioned and the online resources is available to folks, making sure that when we release solicitations for our grant funds, we're going to be releasing those pretty soon for the air grants, how we get that out to people.

So we are learning and we are trying to get better at being able to make sure that the communities all over the state, the hundreds of them, that are interested in the program are aware of the materials, are aware of new opportunities that are coming. But certainly, we always can do a better job.

PANEL MEMBER LANDOLPH: Yeah. I just wanted to sharpen up my earlier comments. It almost seems to me like you'd need a risk assessment done for each district. What are the threats from polluted air, from polluted water, from dermal contact with polluted ground, et cetera, and rank them in that way quantitatively.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS:

Yeah. We have talked about those types of evaluations. And certainly CalEnviroScreen gives us an overarching look at all of the different areas. And we are working with our partners at OEHHA, as new data sets come in, and then looking at that. The challenge is, of

course, is being able to do that kind of analysis statewide to make sure that we do compare them equally, if we are able to do that, and, of course, identifying the data sets that would be necessary to do that.

So we have been talking about that as kind of a long-term vision of where we might be able to go and starting to think through what data sets would be needed in order to do that.

PANEL MEMBER LANDOLPH: And then just a specific question. For the east L.A. area where I work at USC, what unique characteristics of that area chose it -- cause it to be chosen?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS:

Yeah. East L.A. obviously is heavily impacted by commerce railyard that's right there, as well as a lot of the mobile sources coming up from the port, and the on-road sources. There are certainly some of the industrial facilities that are also around them in the City of Vernon and Industry right there.

But the biggest concerns that the community members themselves continue to bring up are the trucks and the passenger vehicles. In fact, that's probably the top priority that they keep bringing up. So we, of course, are heavily involved in these conversations, since the mobile sources are our priority.

PANEL MEMBER LANDOLPH: Thank you.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: Um-hmm.

CHAIRPERSON ANASTASIO: Yes, Lisa.

PANEL MEMBER MILLER: Question. So you mentioned briefly that there may be some issues with data quality, depending upon how you're doing the monitoring. As you implement monitoring stations, is there any concern that the data -- the quality of the day that you get from these presumably newer technologies might be different from the data you collect from all of the preexisting air monitoring sites, and what sort of quality control are you planning?

MLD STAFF AIR POLLUTION SPECIALIST SMITH: Yeah. So like the -- for example, using a low cost sensor is very different than FEM or FRM type monitor. And so each one of those measurements, it needs to be geared towards a certain action. So using a low cost sensor for certain actions may not be applicable. And so all that needs to be discussed during the planning stages and not using data outside of what it was intended to be used for.

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS: We're also -- we're also working on our system called AQ-VIEW, that we're going to be using to display the data. The air districts are required to provide that

to us, and then we will have a statewide portal that shows that.

And one of the ways that we're trying to address this concern is being able to provide that information to folks, so they are aware of what technology is being -- was used to collect that data, and what is the information that was discussed, and the elements, and other things, as the plan was put together for that.

So it will be available to folks. They'll just have to drill down into the data sets to be able to understand. And so over time, certainly, there's going to be an evolution in the technology, and there will be changes in the refinements of the technology. So hopefully, folks will be able to look back and compare, and then say, well, you know, we learned a little bit more, so maybe that data collection maybe we need to -- as we're thinking about that data, maybe we need to calibrate it, or refine it, or whatever.

So we are working to try and figure out how we can capture all of that, so as we move forward, we can adjust accordingly.

MLD COMMUNITY AIR MONITORING BRANCH CHIEF STROUD:

This is Ken Stroud, CARB, Community Air Monitoring Branch.

And to address your question, we are seeing the

districts and the community groups showing a very strong interest in linking all their data back to FRM or state-of-the-art kind of measurements. And we're assisting with that as much as we can.

CHAIRPERSON ANASTASIO: I have a question that maybe a little out of your wheelhouse. But ultimately, the goal is to improve health outcomes, is that right? And so do you expect at some point there will be either epidemiological examination of whether health outcomes were improved or some kind of health outcome monitoring?

OCAP COMMUNITY PLANNING BRANCH CHIEF ARIAS:

Yeah. That's a challenge. The bill itself requires us to reduce cumulative exposure. Because as we all know, if we can reduce cumulative exposure, there will be health benefits. There has been a lot of conversations with the Advisory Committee, the AB 617 Committee that Dr. Balmes chairs, about being able to develop the monitoring necessary to tie things back to what we're doing and the actions that we're doing.

And we are working with OEHHA, and Department of Public Health to figure out how do we move forward in this area, and how do we start trying to figure out how we can make those connections, and what sort of data do we need to be able to collect to do that?

Because as we all know, there's a lot of

different things that impact public health and taking one particular measurement of asthma, or heart rates, or other things, we can't always necessarily directly tie it to one particular action that we take, because there's so many things that are impacting it.

So we're definitely wrestling with that. And Dr. Balmes has been very helpful for us in trying to help push that conversation forward and guide us in that conversation and really encourage us to work with the Department of Public Health and OEHHA who have more expertise in this area. So we're -- it's on our list, and it's definitely something we're working towards in the longer term.

CHAIRPERSON ANASTASIO: All right. So continuing on the AB 617 note, there was a consultation group meeting on April 4th and Mike Kleinman is the SRP representative, so he's going to give us a few highlights from the meeting, after some technical issues.

(Thereupon an overhead presentation was presented as follows.)

PANEL MEMBER KLEINMAN: Okay. This is going to be mercifully short.

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PANEL MEMBER KLEINMAN: So the April meeting, this was the agenda. And the bottom line is to go -- it

was going to go over the work that's underway in the first year communities. And there was a lot of discussion on the best practices. This is a document that came out as an overall guideline. And this was available to all of the communities and, you know, everybody else who was interested.

And it was just sort of a listing of practices that they could implement to ensure that, you know, they got, you know, data that was going to be useful all the way through.

The community selection process at that -- at the April meeting had been pretty much completed. We knew that they were going to be the 10 sites. And there was some update on the various elements, the schedule for installation of controls at industrial facilities were discussed, regulations for reporting criteria pollutants, et cetera.

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PANEL MEMBER KLEINMAN: So the overall big picture that I got was that there's been substantial progress. Initial communities are now at work and they're in the process of developing their plans for monitoring. It's not an even pace. Different districts are moving ahead faster than others. For example, the Bay Area has been, you know, very aggressive about implementing

monitoring on a broad scale. And their approach, they've just put out a contract to a company that does mobile monitoring. And what they're going to do is map PM2.5 and other -- some of the gaseous criteria pollutants on every road in the Bay Area District.

So this is going to be a multi-year project. And it's millions of dollars. But at the end of that, they're going to have the data, along with the traffic data and everything else, so that they could actually do comprehensive monitoring -- modeling rather, and then go back and look at, on a computer, they could tweak, if we reduce traffic in this area by changing regulations on the roads, that sort of thing.

How do we -- you know, whether -- you know, can we improve air quality in a specific area? So I think, you know, that's the sort of thinking that's going on there.

There were some concerns mentioned that some communities that were out there don't have a team of -- you know, either a community team, or an active participation with community groups. And they don't have it in place. And that means they're at a disadvantage of getting support for being one of the future sites.

And so there was some discussion of how there could be some sharing of expertise and also

community-to-community training.

Another concern was that the role the SRP is not really defined. And there is definitely an -- you know, from the participants, they really would like to have a better way for us to participate with their process.

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PANEL MEMBER KLEINMAN: This is going to be hard to read, but there were some specific comments that there is a need, in some of the communities, to have individuals with more policy expertise to participate in their community meetings and give them some guidance.

Some of the other comments were they would like some education on technical aspects of air quality. A lot of the people in these community groups are basically self-trained. They're not scientists. They're, you know, concerned community members, but they've -- their chemical and technical knowledge is, you know, limited. And so they would -- they, you know, express that they would like to have more interaction and be able to ask questions and get a little bit more training.

The different districts are taking different approaches. So the Bay Area has been moving ahead in collaboration with their various communities. And they've built, you know, a very nice coalition.

South Coast district, they're taking a somewhat

different approach, and they're being a lot more deliberate about not just listening to the loudest voices. They want to make sure that they hear from all the various groups and different cities. Different cities have different attitudes towards what's going to be going on.

Paul English we were told is working on developing some of the health outcome data and consolidating that for the Department of Public Health. And he and John Balmes are planning to write a white paper. So hopefully, that will answer some of the questions about how some of the health effects data is going to get integrated into this overall picture.

Some of these distributed monitors like the PurpleAir system, these are very neat little monitors. South Coast has done a lot of work calibrating them. And PurpleAir is a company that has their own website. And every PurpleAir monitor that's out there reports back to the website. And so you can pull up a map and see all of the these data.

And a lot of it, you know, especially where you can match them up to FRMs, they're reasonable. They're not exact. They may be off by 10 or 20 percent, but you can track trends with it. You can also look at what is the distribution of high density PM2.5 in areas?

So there's been a lot of deployment of these

units. And it -- in the future, it may provide some useful info. And it was suggested that as identification of toxic compounds are made for a community, that that information could come forward to the SRP for, you know, us to evaluate, and look at, and perhaps provide some guidance as to potential health outcomes, and even perhaps looking at if they, you know, put in a mitigation method, provide some input as to, you know, what would we expect to see in terms of health improvement.

And that's it.

CHAIRPERSON ANASTASIO: Great. Thank you, Mike.

Just one final topic on the AB 617, I want to acknowledge receiving a letter to the Panel dated June 24th. It was a joint letter from three organizations, California Rural Legal Assistance Foundation, Californians for Pesticide Reform, and the Center on Race, Poverty, and the Environment.

We have forwarded the letter to CARB and DPR. And essentially the letter urges the Panel to support including specific pesticide emission reduction strategies in community emission reductions plans for three of the communities selected in AB 617. It's citing pesticide monitoring data.

Just to clarify, you know, the AB 617 agenda item today for the SRP was really only informational. And in

the discussion about AB 617 during our meeting last March, we learned that air districts are working with communities to develop community emission reductions programs by October, as Jeremy mentioned. And we understand that DPR is working with air districts and community groups regarding these pesticide concerns. And so we look forward to learning more about what will be included in these emissions reductions plans later.

So with that, I'd like to thank Jeremy, Ken, and Heather for their presentation, and appreciate the input from CARB.

And we're going to move on now to our final agenda item, which is an informational update on AB 2588, the Air Toxics Hot Spots Program. So we talk quite a bit about hot spots. And so that's part of AB 2588, the Air Toxic Hot Spots Information and Assessment Law. And under this, certain facilities are required to report their emissions of specified toxics.

And the implementing regulation, which is called the Emission Inventory Criteria and Guidelines Regulation was last updated in 2007 and is currently under consideration by CARB for amendment.

So Michael Benjamin, Chief of the Air Resources Board Air Quality Planning and Science Division is going to present an overview of the regulation, a summary of the

amendments being considered, including changes to the chemical list, and the process and timeline for the Panel's review later this year.

So, Michael, thank you for joining us.

(Thereupon an overhead presentation was presented as follows.)

AQPSD CHIEF BENJAMIN: Thanks, Dr. Anastasio for the introduction. I would like to recognize my colleagues Dr. Anny Huang to my left, who is overseeing the updates that we're making to the AB 2588 regulation. And I'd like to introduce to my right, Beth Schwehr, who has been -- she's an expert on the AB 2588 program and was actually involved in the development of the original program, so she has a great deal of knowledge.

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AQPSD CHIEF BENJAMIN: So for my presentation, I'll start with an overview of the AB 2588 program by providing some background information and walking through the process and requirements of AB 2588.

In the second part of the presentation, I'll present our proposed amendments to the AB 2588 emission inventory criteria and guidelines document. I'll focus on our proposed process for updating our list of toxics substances, which is an area that I know that you're especially interested in and that we would like to get

your input on.

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AQPSD CHIEF BENJAMIN: At the March SRP meeting, you heard from Karen Magliano and Dave Edwards on CARB's implementation of the AB 617 program, as well as CARB's new Criteria Pollutant and Toxics Reporting Regulation.

At that meeting, identification of toxic chemicals in the AB 2588 program was briefly mentioned, as it sets the stage for understanding the public's exposure to air toxics and health risk. The work of the SRP in reviewing the health values developed by OEHHA is an integral part of the AB 2588 process.

So when a chemical has been identified to have a potential for causing health risk, dose response data are often not yet available for quantifying health risk. Compiling an emissions inventory of potentially hazardous chemicals includes collecting data on the actual locations and amounts of emissions emitted, and is essential for understanding the extent of public exposure to those chemicals.

But in understanding -- but in order to quantify the actual health risks, health values, which would include cancer potencies and non-cancer reference exposure levels must be developed.

There are currently, as this slide shows, 468

existing chemicals in the program. Of these, there are 240 for which we have health values and 228 for which we don't.

Development of scientifically peer-reviewed health values for a given chemical requires a significant amount of time and resources taking up to two years.

As a first step, OEHHA must prioritize which chemicals to focus developing health values on. To help them do this, OEHHA staff reviews the toxics emission inventory that CARB and the local air districts collect from facilities.

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AQPSD CHIEF BENJAMIN: With that background context, I'll now go into an overview of the AB 2588 program.

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AQPSD CHIEF BENJAMIN: AB 2588, the Toxics Hot Spots Information and Assessment Act was signed into law in 1987 to address public concern about potentially significant exposure to air toxics emitted by facilities. It established a public right to know program for air toxics by creating a process for facility operators to estimate toxic emissions, collecting data -- emissions data and making those emissions data available to the public, identify which facilities have localized impacts

and must conduct health risk assessments, and outlining a process for facilities to provide public notification and reduce risk impacts.

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AQPSD CHIEF BENJAMIN: The process -- the AB 2588 process starts with the facility operator. This is on the far left-hand side of the slide, conducting an air toxics emissions inventory according to criteria and guidelines developed by CARB. Using the inventory data, the local air districts then prioritize each facility to determine whether a health risk assessment must be conducted.

A facility classified by the district as low priority is not subject to further requirements at this point. An intermediate priority facility is required to do a quadrennial toxics inventory. So that's if you look at the middle of this slide and then over to the right.

Whereas, a high priority facility must conduct health risk assessments according to the methods developed by OEHHA. Health risk assessments are reviewed by OEHHA and approved by the air district. Based on the result of the assessment, the air district further classifies the facility as low, intermediate, or high risk.

Similarly, a low-risk facility is not subject to further requirements. An intermediate-risk facility must do a quadrennial inventory. A high-risk facility proceeds

to notify the public of the significant risk and is required to take further steps to reduce the public's exposure to air toxics. They must conduct a risk reduction audit and develop a plan to implement air toxic risk reduction measures.

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AQPSD CHIEF BENJAMIN: Besides the process shown in the previous slide, AB 2588 has additional requirements for CARB, OEHHA, and local air districts. AB 2588 requires CARB to make emissions data collected under the program available to the public. We've done this with a web-based facility emissions query tool, as well as with a interactive mapping tool that the public can use to geographically look up emissions data.

AB 2588 also requires CARB to maintain a list of chemicals that pose chronic or acute health threats when present in the air. This is the element of AB 2588 that we hope to get SRP's input on and which I'll focus on in the second part of my presentation today.

OEHHA's role in AB 2588 includes reviewing health risk assessments, preparing risk assessment guidelines, and developing health values for toxic chemicals that are then reviewed by the SRP.

In addition to implementing the AB 2588 process of emission inventory facility prioritization, risk

assessment, public notification, and risk reduction, local air districts are required to make health risk assessments available for public review and publish annual reports on the implementation of the AB 2588 program.

The Hot Spots Program has resulted in many benefits over the last 30 years. It's identified sources of toxics emissions not previously under evaluation and provided exposure information necessary for CARB to prioritize the development of air toxics control measures and regulatory actions.

Also, preparation of a toxics inventory has made facility owners aware of their toxics releases. It's created an incentive for facilities to take voluntary actions to reduce their toxics emissions, even before they reach the formal risk reduction step in the process.

Lastly, it provides the public with information about toxics releases and health risk exposure.

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AQPSD CHIEF BENJAMIN: In the second part of my presentation today, I'll describe our proposed rule amendments and highlight the aspect of the amendment that we especially would like to benefit from the SRP's expertise and from which we'd like your input.

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AQPSD CHIEF BENJAMIN: AB 2588 requires CARB to

maintain the emission inventory criteria and guidelines for the Hot Spots Program. The guidelines not only outlines the criteria for conducting the toxics inventory, it also includes a list of have toxic substances to be reported, the applicability thresholds for large and small facilities, and requirements for when source testing must be conducted.

The guidelines have been amended periodically over the years, and were last amended in 2007. Updates are now needed in several areas. The Health and Safety Code requires CARB to periodically update the list of chemicals for AB 2588 reporting. Since 2007, many new chemicals have emerged and there are -- there's also more evidence of concern from various toxicity studies.

We're reviewing information on new chemicals to update the AB 2588 chemical list. I'll go into more details on this item in the next five slides.

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AQPSD CHIEF BENJAMIN: The guidelines provides technical guidance on which chemicals are expected to be associated with which emitting processes or industry sectors. It helps facilities and local air districts know which toxic chemicals to look for in compiling or reviewing the inventory. And we plan to update this guidance with newly identified chemicals.

OEHHA has come up with new childhood cancer risk factors and it's tightened up the reference exposure levels, or the RELs, for some chemicals. We're reviewing the sector-specific applicability thresholds and we're considering updating these thresholds to reflect the new science.

In addition, we plan to update the incorporated references to reflect the most recent OEHHA risk guidelines, CAPCOA - that's the California Air Pollution Control Officers Association - prioritization guidelines, dispersion modeling methodology, and revised test methods.

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AQPSD CHIEF BENJAMIN: AB 2588 requires CARB to compile and maintain a list of substances for assessing toxic air pollutants. The statute explicitly identifies the following six lists of chemicals published by international, national, and State agencies. This includes CARB's Toxic Air Contaminants list; U.S. EPA's Protection Agency's Hazardous Air Pollutant, or HAPs, list; the International Agency for Research on Cancer, IARC's list; Prop 65 list; the U.S. Department of Health and Human Services National Toxicology Program list; and the California Department of Public Health's Hazard Evaluation System and Information Service, or HESIS, publications. These lists have anywhere between 200 to

1,000 different chemicals listed.

The statute also has an explicit provision for CARB to consider additional chemicals that may present a chronic or acute threat to the public, but have not been formally listed in these six sources.

Yes.

PANEL MEMBER BLANC: Just a slight interruption. On the IARC list is that only IARC 1 or is it 1 and 2A?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: We consider all of the IARC substances, but we give priority to group 1, 2A and 2B.

PANEL MEMBER BLANC: Thank you.

When you say we give consideration, you mean they are -- that just being their wouldn't get them on your list. Then they'd have to -- it would have to be some other decision.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

That's right. Michael is going to talk in an upcoming slide about sort of the criteria that we use to determine whether they belong on the list.

PANEL MEMBER BLANC: Okay.

AQPSD CHIEF BENJAMIN: So public health experts have raised concerns to us that many chemicals have gone into commercial use, but are later found to pose significant public and environmental health threats.

They've pointed out to us that it can be decades before emerging chemicals make it onto one of the six lists cited by the statute.

They've urged CARB to consider a more proactive approach to include emerging chemicals in the AB 2588 list. And the U.S. EPA's Significant New Use Rules, or SNUR, list, which is under the federal Toxics Substances Control Act is an example of a data source that we're also reviewed for emerging chemicals.

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AQPSD CHIEF BENJAMIN: So in the emission inventory criteria and guidelines, chemicals are grouped into three lists or three parts. The first part contains substances for which emissions must be quantified in a facility's emission inventory. The second part contains substances for which their production use or other presence must be reported. And the third part contains substances that are required to be reported, only if they're being manufactured in California by a facility subject to the program.

Now, a substance with low carcinogenic ranking, but which has a potential to become airborne may be assigned to the second part of the list. Although we don't require quantification of emissions for such chemicals, its production and use quantities should be

tracked to inform potential occupational exposure.

An example of a substance that may be assigned to the third part of the list includes the carcinogen, for example, an oral pharmaceutical that would not be expected to have airborne emissions, unless the manufacturing facility could potentially release some of the materials during manufacturing and the packaging process.

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AQPSD CHIEF BENJAMIN: So to address the question of Dr. Blanc, what are the criteria that are used?

So the hot spots statute provides instructions for determining which chemicals should be included in the AB 2588 list. There are two criteria. Can the substance be airborne and be present in California and then what's the potential toxicity?

In reviewing the candidate chemicals for the AB 2588 list, CARB staff considered many factors in evaluating their potential for public health impacts.

For example, how is the substance being used? Can the substance become airborne outside of a private facility or business? The chemical structure and property, as you well know, of these products can inform whether it can be airborne. If a chemical is relatively light, that is if it has a low molecular weight or it has a fairly low boiling point, this is an indication that the

chemical is likely to be airborne.

There are also special considerations for heavier substances to become airborne as well. For example, if a product is designed to be sprayed on a hot surface or a hot engine, or if it's a byproduct of combustion, the chemical could become airborne, even if it's not volatile at room temperature.

We also consider a chemical's potential toxicity. Because current scientific understanding of cancer risk does not recognize any safe thresholds for cancer-causing chemicals, carcinogens are generally given high priority for inclusion on the AB 2588 chemical list.

Besides inhalation, some chemicals have the potential for deposition into water or onto soil resulting in multi-pathway routes of exposure. Multi-pathway exposures can dramatically increase overall public exposure and risk compared to inhalation alone.

Also, we recognize that some chemicals don't break down readily in the environment or in living organisms. So, for example, persistent bioaccumulative toxics, or PBTs, may accumulate as they pass up the food chain and result in high body burdens.

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AQPSD CHIEF BENJAMIN: Okay. So where are we in this process?

CARB staff has worked in close consultation with our colleagues at OEHHA in this chemical review. To date, as you can see in the slide, we reviewed ore than 1,300 candidate chemicals for their potential inclusion in AB 2588. Using the selection criteria that I've just discussed, we found that about half of the chemicals may potentially lead to air toxics exposure. That's 449.

We have sorted these chemicals into the three groups discussed in slide 12. About 450 chemicals are proposed to be added to the list of chemicals for which emissions must be quantified. So this is about double the number of chemicals that are currently in the AB 2588 program.

This includes 282 new individual chemicals, 100 additional chemicals to be added to existing chemical groupings, and 67 chemicals to be listed under new chemical groupings.

160 -- or actually, it looks like 156 chemicals are proposed to be added to the second and third parts of the AB 2588 chemical list, for which emissions quantification is not required, but use, production, and other presence needs to be reported.

In addition, as this slide shows, we'll be making miscellaneous updates to 20 existing chemicals. These include specifying an official CAS number for chemicals

that didn't have one previously. So where are we? The chemical review is still a work-in-progress.

--o0o--

AQPSD CHIEF BENJAMIN: We've done a lot, but we still have more than 60 chemicals that are still pending review that staff are going to be working through in the next month or so.

A new element of the chemical list that we are considering is specifying functional groups of substances that only slight -- that are only slightly different that for which they each have their own individual CAS number. We'll gauge the potential for toxicity based on the functional groups in the chemical structure.

In the following months, we plan to continue working with our partners in OEHHA, DPR, and the local air districts to complete our chemical review.

--o0o--

AQPSD CHIEF BENJAMIN: But from your perspective, what would we like from you?

Well, as you know, we're working full speed to complete our chemical evaluation within the next month, and we'd like to provide a draft chemical list for your review in early August, so in about six weeks.

PANEL MEMBER BLANC: Can I clarify one other thing?

AQPSD CHIEF BENJAMIN: Yes.

PANEL MEMBER BLANC: So the numbers that you're talking about are the numbers that are being added to the list that already exists or are we talking -- right, that's correct?

AQPSD CHIEF BENJAMIN: That's correct.

PANEL MEMBER BLANC: Can you just clarify what is the number on the list before you started all this, roughly?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: Appendix A1 has about 450 or so right now.

PANEL MEMBER BLANC: Okay. And then if -- do you have, at your fingertips, the list, just if I wanted to ask as an example, exemplar chemical, whether -- what you decided about it? I mean, is that -- do you have access to that as we sit here?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: We can probably give it a try.

PANEL MEMBER BLANC: All right. So one question I would have, for example, is given the emerging hazard of diacetyl, the artificial butter flavoring chemical, was that --

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: Diacetyl. Yes.

PANEL MEMBER BLANC: -- did that make it on your

list for example?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

Yes.

PANEL MEMBER BLANC: And then -- that's good to hear. And then the related diacetyl substitute that has been introduced whose name I'm forgetting, penta -- the 5-carbon analog.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

That's the good one. I'd have to check for sure. I think so, but I'm not positive.

PANEL MEMBER BLANC: Okay. And then how have you handled the quagmire of the various isocyanates? Is that an example of a group and -- that you've added to -- an existing group that you've added to?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

Yes. We've been paying close attention to the way the isocyanates that have come before this group have been identified and how their health values track with different subgroups of that. So we're proposing to restructure the isocyanates group into subgroups that track the health values. There will be individual ones listed, as well as occasionally like a header to the subgroup, and that would also cover other ones that aren't individually already specified.

PANEL MEMBER BLANC: Because another -- I mean,

one of the reasons why some of those fall below too in their practices because actually federal OSHA has never made standards for any of those. So if you rely on federal OSHA, you'd -- they don't exist in that realm. But if you look at -- you've probably already done this, but if you look at the ACGIH background criteria. That's where you'll see one group that deals with emerging chemicals. So that might be a -- you may have already done that, but I think that's a very useful backcheck.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: We were also aware that there were a number of chemicals in -- that Michael mentioned the Significant New Use Rule, EPA's sort of very long list of chemicals that they're asking the manufacturers to notify them about. Many of them have isocyanate groups, functional groups within them.

So Michael mentioned the idea -- this new idea of functional group, a few at least that we wanted to try. Isocyanates is one of those. So we'll have some isocyanates explicitly on the main body of the list. We're proposing potentially to have a functional group that says anything with an isocyanate functional group within it may also potentially be added to the list.

PANEL MEMBER LANDOLPH: Nice presentation. Very interesting.

AQPSD CHIEF BENJAMIN: I have a few more slides.

PANEL MEMBER LANDOLPH: Oh, go ahead.

(Laughter.)

--o0o--

AQPSD CHIEF BENJAMIN: These are great questions, by the way. So I do have a few more. And that may answer some of the questions that you have, but...

Okay. So what would we exactly like your input on once we give you this list?

We'd like to know is the list complete? Are we missing anything? Are there any other toxic chemicals that we should add? And do you have input on the way that we're currently categorizing and grouping the chemicals?

So as I mentioned, we're planning on providing a list to you in early August. And then when we come back in object to the SRP meeting, we'd like to hear from you and provide -- we'd like to hear your feedback and your thoughts on what we're proposing.

PANEL MEMBER LANDOLPH: Okay. Are you finished?

--o0o--

AQPSD CHIEF BENJAMIN: And then --

(Laughter.)

AQPSD CHIEF BENJAMIN: Okay. Sorry. Just a few more. I'm almost done. Just to provide some wider context on the rulemaking itself and the timing. So we

will be having a public workshop in late 2019 and then we're planning to go to our Board with the updated amendments in early 2020.

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AQPSD CHIEF BENJAMIN: And then finally, here is some contact information for some of the key folks involved in the rulemaking. And with that, I will open it up to questions.

PANEL MEMBER LANDOLPH: Thank you.

One comment is regarding carcinogens, which I'm an expert in. The span of the slope factors for carcinogens, it runs about six orders of magnitude. So I think sooner or later you'll be forced into a situation, you know, where you report those numbers and track the ones with the higher slope factors up towards the top in terms of priorities for them.

The other thing is there's been an estimate that something like 15 percent of all chemicals are carcinogens. Some people think that's a little bit of an over-estimate, but it's a reasonable assumption to get started with.

So obviously, you'll have to be careful how much regulatory authority you focus on regulating, because you don't want to do everything. You want to deal with stuff like aflatoxin, which is way at the top. Benzo[a]pyrene

is kind of in the middle. Dibenzo[a]pyrene is like a couple orders of magnitude worse than benzo[a]pyrene, and they're both found in cigarette smoke. So you'll have to track these as to, you know, what's worth putting effort into and what's not, you know, like a triage system.

With regard to the toxins, I would suggest segregating them. Something to the effect like neurotoxins, developmental and reproductive toxins, and then your other toxins, and thinking about the slope factors and trying to triage those along the same lines, so you don't have to spend infinite amounts of regulatory effort, which will be difficult to pay for, you know, in terms of societal protection.

Thank you.

CHAIRPERSON ANASTASIO: Michael, I had a question for you on the presentation. On slide 3, you talk about the 468 existing chemicals that are on the list and about 240 have health values and 228 don't have health values. I'm just wondering what the limiting factor is in getting health values for those other 228. Is there not enough exposure data or is it just that it's a slow process to actually develop a REL or cancer potency factor?

AQPSD CHIEF BENJAMIN: Yeah, I guess this is a -- I didn't want to -- I didn't want to speak for one of my sister agencies, so I have John Budroe here, who I think

is better qualified to respond to that.

DR. BUDROE: Quite frankly, it's just a question of bandwidth, you know, having enough people to get -- develop the health values and then getting them through the process. And we actually do remarkably well. Most of the time we have one or two, maybe at most three, people working on a chemical. And if you look U.S. EPA IRIS documents, they have like 40 or 50, and we turn out about as many as they do.

So it's -- you know, it's just going to take a along -- those 228 without health values it's going to take a long time to get those all taken care of to get either slope factors or RELs for all of those.

CHAIRPERSON ANASTASIO: I guess it really speaks to the crucial importance of prioritizing which chemicals end up going into the REL or cancer potency factor pipeline, right? Because if that's the limiting factor, we really want to make sure we're putting only the most important ones in there.

DR. BUDROE: Right. Well, part of it is though too there's so many obvious bad actors out there, that in the end it's not too tough to prioritize what the top 5 or 10 are. You know, for example, some of the ones that we've got in the pipeline now are like we're doing a REL for trivalent chromium, because at the request of both

CARB and the air districts because that's an alternative to hexavalent chrome for chrome plating, but there's no health values associated with it. So you need to have an idea of what, you know, the health effects are and how much are associated with the use of that in chrome plating before you go to that, you know, on a wide basis.

We've got another chemical, para-chlorobenzotrifluoride, that just recently there's NTP cancer data for it. And that's actually been granted the OC exemptions by a number of the districts.

So all of a sudden you've got a chemical that you're replacing -- you're replacing smog formers with it, but it's a carcinogen. So that's one we're working on. And we -- pretty much everything that we've got under development is like that. They're really obvious choices.

CHAIRPERSON ANASTASIO: Thank you.

Oh, sorry. One other question, Michael. So on slide 6, you talk about the AB 2588 process. So the health risk assessment, that's done by the district and then reviewed by OEHHA?

AQPSD CHIEF BENJAMIN: The district does do the heath risk assessment. And then, Beth, does OEHHA review it?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: The facility does.

AQPSD CHIEF BENJAMIN: The facility does. Okay.

DR. BUDROE: The facility does the health risk assessment. They submit it to the air district. The air district looks at it and either decides to pass it on to us for review or, you know, sends it back to the -- for revision. We look at that and we write a review on it and send that review to the air district.

CHAIRPERSON ANASTASIO: I see.

DR. BUDROE: And we -- I will note that recently we've actually turned facility HRAs back to the air districts and said you have to get the facility to redo this. So we actually do look fairly intently at those facility HRAs when they come in.

CHAIRPERSON ANASTASIO: And then the assessment coming back high, does that mean ambient concentrations above the REL or above the 10 to the minus 6 cancer risk factor? What -- how do you get to high?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

Under the statute, the 2588 statute, each district is required to determine a threshold for its district. And it has to go in front of the district board in a public process. So each of the districts has determined thresholds that they consider to be their significant risk levels. Some of them have multiple milestones. Some of them will have a significant risk

level for that first step in the public notification and maybe a different level for the -- what triggers risk reduction audit and plan. For most of the districts -- it's not across the Board, but for most of them, a high risk is considered -- for cancer, it would be 10 cases per mill. For the RELs, it would generally be above 1, sometimes 10. So that -- there's some variability there.

But -- so each district -- we actually have a table on the website of what the district's -- each district's thresholds are for those steps.

CHAIRPERSON ANASTASIO: Are there other questions from the Panel?

PANEL MEMBER KLEINMAN: This is sort of on functionality. If you're going to give us a list, can you -- do you have a feeling for what the format is that you're going to be able to do. For example, it would, you know, maximally good to have it as some sort of a database, or spreadsheet, or something where we can, you know, flag things, and then search on flags and stuff like that.

AQPSD CHIEF BENJAMIN: I was going to ask you what format you'd like. But fortunately, we already have it in a spreadsheet. Will that work for you?

PANEL MEMBER KLEINMAN: I think so. Well, that's a good start.

AQPSD CHIEF BENJAMIN: So you should be able to sort it and rank things as -- and work with it in a number of different ways, yes.

(Thereupon a discussion occurred off the record.)

AQPSD CHIEF BENJAMIN: We can also print it out.

(Laughter.)

CHAIRPERSON ANASTASIO: How long is it printed, Michael?

(Thereupon a discussion occurred off the record.)

CHAIRPERSON ANASTASIO: But how long is the spreadsheet if it was printed?

AQPSD CHIEF BENJAMIN: Well, Anny.

CHAIRPERSON ANASTASIO: Roughly.

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: Well, it depends on the font size. Would you like to have 9 fine class? No, just kidding.

CHAIRPERSON ANASTASIO: No.

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: Well, right now, we have like about a thousand. So between, you know, 1 and 1,000 between existing chemicals and the new chemicals. And so we have like new chemical has 3 tabs. Each gets three groups. And we also have existing chemical have 3 tabs. So there will be multiple tabs. If you would like us to format it in a way that's very ease to print out, we can certainly help you

with that.

CHAIRPERSON ANASTASIO: I think it would be helpful for purposes of discussion if we were all going off the same printed page as well, so that we can -- but I agree, the spreadsheet would be very helpful in terms of doing our work on our own. But I think in terms of a discussion for the SRP, having a printed version where we're all on the same page literally would be helpful as well, unless it's going to be some enormous document.

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: Yeah, we can certainly do that, yes.

CHAIRPERSON ANASTASIO: Okay. Thank you.

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: And we can put an index on the pollutant so we can say pollutant number 245.

CHAIRPERSON ANASTASIO: That would be great, right. Some way to refer to individual compounds without having -- without having to go to the name necessarily.

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: We can certainly do that.

CHAIRPERSON ANASTASIO: Yeah.

Are there other comments from the Panel?

I think one of the questions that comes to my mind is how do we divide this up? You know, so typically for a REL, we'll have two leads and everyone will read the

document and give additional input. But this is obviously a very different beast. And it's hard to know how to divide it up without seeing it. And so I don't know perhaps -- Michael, do you have any discussions about how this could be tackled by --

AQPSD CHIEF BENJAMIN: I think Anny's -- she's been thinking about it.

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: Well, I know each of the SRP member has their expertise and maybe they -- you have a favorite group of chemicals. So maybe we would just, you know, provide a list in early August, and then maybe among yourself you could decide whether you have a particular favorite group of chemicals you would like to tackle.

CHAIRPERSON ANASTASIO: Roughly, how many groups are we talking about?

AQPSD EMISSION INVENTORY ANALYSIS SECTION MANAGER HUANG: It can be divided up in any way. So, Beth, do you have any thoughts about that?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

Well, I guess one question I would have, would there be an interest in dividing say carcinogens out from things that are not currently called carcinogens?

Would that be a first division?

CHAIRPERSON ANASTASIO: Yeah, I think that's a

great division, yeah.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: Okay. And --

PANEL MEMBER KLEINMAN: Pesticides.

PANEL MEMBER LANDOLPH: Neurotoxins.

PANEL MEMBER KLEINMAN: And then, you know, there could be a -- you mentioned chromium. I don't know if there are other inorganics. But putting the inorganics in one basket would be good.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: So, for example, all the metals would be another we one we could create.

(Thereupon a discussion occurred off the record.)

PANEL MEMBER LANDOLPH: Yeah, I would suggest breakout the developmental and reproductive toxins, the DARTs into another category.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: We have that information obviously from Prop 65, because it does group it that way. From some of the other lists, NTP and others, where they might be mixed, is there any guidance you would have to help us make that determination or we could put them all there and you guys can look at them and choose?

PANEL MEMBER KLEINMAN: Well, you know, if we're starting with a spreadsheet, there could just be a column,

inorganic, pesticide. And then that way we can -- let's pull up all the inorganics that are carcinogens. You know, it would make it easier for us to help prioritize.

CHAIRPERSON ANASTASIO: Well, this is an exciting opportunity for the Panel. I know I've been on the Panel for six years and I think we've been talking about wanting to get input on this for at least six years. So thank you for bringing this to us. We're looking forward to it. I'm sure it will be a monumental amount of work, both for -- well, primarily for you, but also for us.

Yes, Joe.

PANEL MEMBER LANDOLPH: Yeah. I had another thought. Maybe you could break out from among the toxins, those that are kind of exotic, you know, which have very high slope factors for toxicity, so we can pull them away from more prosaic things.

AQPSD CHIEF BENJAMIN: Thank you. These are excellent suggestions. And it makes it clear the benefit of coming to the SRP and having your input. It's already bearing fruit, and we look forward to having some really great feedback in October after you've had a chance to really dive into it.

CHAIRPERSON ANASTASIO: So related to that, Michael, I mean, the input you'd like from the SRP, is it high priority compounds, compounds that are missing? I

mean, what would you like from us?

AQPSD CHIEF BENJAMIN: So we definitely want to make sure we're not missing anything.

CHAIRPERSON ANASTASIO: Okay.

AQPSD CHIEF BENJAMIN: Because we're relying on these lists. We're relying on our in-house expertise, which is pretty significant. But nonetheless, you have a wide breadth of experience that we don't have. So are we missing anything? Prioritization, I think, would be helpful in terms of what should we be focusing on. Beth, is there anything else that comes to mind?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

One thing, like a question that I have that's come up is when we peruse the six lists that are required by the statute, we came up with a certain group of say the brominated flame retardants. When it came to my attention that there is a list under biomonitoring California, for example, there is both the metabolites, but also the parent compounds, which are ones you might expect could be candidates for our list, there are additional chlorinated and brominated flame retardants on that list.

They would not normally be picked up, because they're not on those other six lists. But the CARB authority to add additional things could be invoked, if that's appropriate.

So we're looking for some guidance there of that -- would that be the sort of thing we should go beyond the six mandated lists? Do they meet those criteria on the slide that Michael had shown of, you know, could there be presence in the air in California, do they have toxicity concerns enough to where they would be a public health concern?

And so that's the kind of thing we're looking for. Because right now, our mandate is to look through those six particular lists. EPA, for example, one of those six lists is the HAPs list, the hazard air pollutant list. But that still pretty much refers to an old section of code that really isn't getting updated that much, right?

EPA has a lot of other types of actions and lists that they're looking at. Are any of those things that we should be very carefully considering as well? Those are some of the kind of things we're wondering about.

CHAIRPERSON ANASTASIO: So are these materials that are not on the six lists, but there's evidence for? Are those going to be on the spreadsheet?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

Some of them, yes. One thing we could do is, for example, I have downloaded the latest Biomonitoring California list. It might be worth maybe just providing

that, along with a spreadsheet, and you can see where we haven't added certain things and whether we should, for example.

CHAIRPERSON ANASTASIO: Yeah, that would be helpful. I mean, you are the experts on this. So if there are candidates that you're wondering about, it would be great to have them on the spreadsheet, and then maybe an indication that these are not on one of the six lists, but they're of concern because of other reasons.

AQPSD CHIEF BENJAMIN: Yeah. So we were thinking that -- looking at slide 14, we were thinking that we would include not only the ones that we are proposing to add to the list, but also the ones that we reviewed and are proposing not to add, so you see that full universe.

CHAIRPERSON ANASTASIO: That would be great.

PANEL MEMBER KLEINMAN: And it might also be helpful, if it's not there already, just some indicator of how widespread is it its use in California, because then something that's moderately toxic would be important.

PANEL MEMBER BLANC: So going back to the example we talked about, diacetyl. Was that actually on one of the six lists?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: Yes, that one did come up on the list.

PANEL MEMBER BLANC: What -- do you remember

which one, because there's no OSHA standard for it, is there? It's not an IARC chemical.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: No, it's not.

PANEL MEMBER BLANC: And it's not already on the TAC list, I don't think.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: No. It was either -- I think it was either NTP, HESIS, or Prop 65.

PANEL MEMBER BLANC: HESIS. It would have been HESIS.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: It would probably have been a HESIS alert, yeah.

PANEL MEMBER BLANC: Okay. So anything that was a HESIS alert got on to your --

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: Yes.

CHAIRPERSON ANASTASIO: And so within the spreadsheet, there's some information about toxicity that's known, in terms of high tox -- highly toxic, low toxic? I mean, is that on there or no?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: Well, for the -- for the new proposed candidate chemicals, we have kept notes where when we would look up the chemical, there might be qualitative information about

toxicity. There is under the PubChem website is pretty good about having manufacturers submit, oh, we see skin irritation, we see eye irritation, things like that. Well, we have noted those things where it's available.

But, in general, for the new chemicals, we're not aware of quantitative health data very often, you know, slope factors, things like that were usually not available for a lot of these. So we would not have a lot to offer there. We'd be kind of working together to try to figure some of those things out.

CHAIRPERSON ANASTASIO: Okay. Thanks.

Yes, Joe.

PANEL MEMBER LANDOLPH: Is your HC doing any computational toxicology, the way EPA and some of the other people are trying to do it to accelerate the rate of dealing with carcinogens, looking at structure activity relationships and stuff like that?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR:

John, do you want to talk about that. We've spoken with John about this.

DR. BUDROE: We have discussed this both internally and we've had workshops, for example, where U.S. EPA has come in and talked about Computational Tox, and Tox21, and read-across methods. And a lot of those techniques are promising. Whether they're at the point

where you can confidently use them to make a prediction as to whether a chemical is going to be toxic enough to be put on the list or not, that's still up in the air.

PANEL MEMBER BLANC: And then as another area of generating chemical substances, would all registered pesticides in California have been looked at by you all?

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: We have been looking at a long list of pesticides. I think that we probably have considered all the registered ones. We have -- we have sent our list for some review with the Department of Pesticide Regulation. We may have made some cuts based on the Pesticide Use Report. They may be registered, but they're not like used right now in California. So there may be cases where we would not include certain registered pesticides.

PANEL MEMBER BLANC: But you've looked at them, so good.

AQPSD STAFF AIR POLLUTION SPECIALIST SCHWEHR: But we would have tried to cover them all, yes.

PANEL MEMBER BLANC: That's great.

DR. BUDROE: And, Dr. Kleinman, you had an earlier comment about focusing on chemicals that are produced in California -- or used in California. Part of the problem is which comes first, the chicken or the egg? If they're not reporting them -- for example, chemicals

are being emitted on our hot spots inventory, how do you know if they're using them or not? And it's -- I mean, you're only other really good source is U.S. EPA TRI. And that's a really -- there's not that many chemicals on the TRI database.

So sometimes you would like to know, but you just don't. You don't have that data. And I'm -- we're looking at one of the chemicals in our REL pipeline right now is n-methylpyrrolidone. And it was being reported on hot spots for a few years and then it disappeared. And we don't really know why it disappeared. But probably our best guess is that it wasn't required to be reported, so facilities were reporting it inadvertently and then when they realized they didn't have to report it, they cut it off, so...

PANEL MEMBER KLEINMAN: Well, one more thing from me would be circling back to 617. If there are chemicals that are on the community's list of interest, things that they're concerned about, this would be a good place to integrate that process in.

AQPSD CHIEF BENJAMIN: That's an excellent suggestion. Thank you, Dr. Kleinman.

CHAIRPERSON ANASTASIO: Okay. Any other comments?

If not, then thank you very much for the

presentation and we look forward to seeing you in October.

Yeah, just the final Agenda Item, number 5, consideration of administrative matters. This is where I'm going to remind you that our next Panel meeting is October 4th, 2019. Jim, I believe, will be sending out a poll to try to schedule a winter meeting.

Yes. I got the nod.

So, again, please be as flexible in your availability as you can. And --

PANEL MEMBER BLANC: October 4th, not October 5th.

CHAIRPERSON ANASTASIO: October 4th.

PANEL MEMBER BLANC: Yes. Right. Sorry. Never mind.

CHAIRPERSON ANASTASIO: Perfect. Any other items from the Panel?

If not, thank you very much for your time. And I look forward to seeing everyone in October.

PANEL MEMBER KLEINMAN: Move for adjournment.

CHAIRPERSON ANASTASIO: Oh, yes. Sorry. A motion to adjourn.

Second?

PANEL MEMBER MILLER: (Nods head.)

CHAIRPERSON ANASTASIO: All in favor?

Let the record reflect that it's unanimous.

All right. Have a good day, everyone.

(Thereupon the California Air Resources Board, Scientific Review Panel adjourned.)

C E R T I F I C A T E O F R E P O R T E R

I, JAMES F. PETERS, a Certified Shorthand Reporter of the State of California, do hereby certify:

That I am a disinterested person herein; that the foregoing California Air Resources Board, Scientific Review Panel meeting was reported in shorthand by me, James F. Peters, a Certified Shorthand Reporter of the State of California;

That the said proceedings was taken before me, in shorthand writing, and was thereafter transcribed, under my direction, by computer-assisted transcription.

I further certify that I am not of counsel or attorney for any of the parties to said meeting nor in any way interested in the outcome of said meeting.

IN WITNESS WHEREOF, I have hereunto set my hand this 29th day of July, 2019.

JAMES F. PETERS, CSR
Certified Shorthand Reporter
License No. 10063