APPENDIX A

MAPS OF SELECTED COMMUNITIES TO MONITOR
Monitoring site location and pesticide use around the City of Ripon
MONITORING SITE LOCATION
ORGANOPHOSPHATES

Ripon
Total Pounds
Active Ingredient
for 2006 - 2008

Organophosphates
- 10 - 696
- 697 - 1,383
- 1,384 - 2,069

Air Monitoring Station
Highways
Water Features
Ripon Community
Regional Buffer - 5 miles

Wind Speed
0 - 1.5
1.6 - 3.1
3.2 - 5.7
5.8 - 8.8
8.9 - 11.7
> 11.7
Color: 0.000°C
OTHER TYPES OF PESTICIDES

Ripon
Total Pounds
Active Ingredient for 2006 - 2008

Others
- 1 - 871
- 872 - 1,742
- 1,743 - 2,612

Air Monitoring Station
Highways
Water Features
Ripon Community
Regional Buffer - 5 miles

Wind Speed (mph)
- > 11.1
- 9.8 - 11.1
- 8.5 - 9.8
- 7.0 - 8.5
- 5.7 - 7.0
- 3.6 - 5.7
- 2.1 - 3.6
- 0.9 - 2.1
- < 0.9

Com: 0.20%
Monitoring site location and pesticide use around the City of Shafter

MONITORING SITE LOCATION

Shafter, Kern County
FUMIGANTS

Shafter
Total Pounds
Active Ingredient for 2006 - 2008

Fumigants
- 13 - 82,713
- 82,714 - 165,413
- 165,414 - 248,112

Air Monitoring Station
Highways
Water Features
Shafter Community
Regional Buffer - Smaller

Wind Speed (mph)
- 11.1
- 0.0 - 11.1
- 0.7 - 8.8
- 2.1 - 3.5
- 0.6 - 2.1

Calendar: 02/2008
OTHER TYPES OF PESTICIDES
Monitoring site location and pesticide use around the City of Salinas

MONITORING SITE LOCATION

Salinas, Monterey County
ORGANOPHOSPHATES

Salinas Total Pounds Active Ingredient for 2006 - 2008

Organophosphates

<table>
<thead>
<tr>
<th>Color</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>1 - 1,927</td>
</tr>
<tr>
<td>Yellow</td>
<td>1,928 - 3,854</td>
</tr>
<tr>
<td>Red</td>
<td>3,855 - 5,780</td>
</tr>
</tbody>
</table>

Air Monitoring Station
Highways
Water Features
Salinas Community
Regional Buffer - Smaller

Wind Speed (km/h)

- 0 - 1.1
- 1.1 - 2.5
- 2.5 - 5.7
- 5.7 - 11.1
- 11.1 - 22.0
- 22.0 - 44.0
- 44.0 - 88.0
- 88.0 - 175

Cum: 7.70%
OTHER TYPES OF PESTICIDES

Salinas Total Pounds Active Ingredient for 2006 - 2008

Others
- Green: 3 - 672
- Yellow: 673 - 1,341
- Red: 1,342 - 2,010

Air Monitoring Station
Highways
Water Features
Salinas Community
Regional Buffer - Smaller

Wind Speed Distribution:
- >11.1 mph
- 8.8 - 11.1 mph
- 5.7 - 8.8 mph
- 3.1 - 5.7 mph
- 0.5 - 3.1 mph
- Calm: < 0.5 mph
APPENDIX B

DERIVATION OF SCREENING LEVELS
Health Evaluation Methods

No state or federal agency has established health standards for pesticides in air. Therefore, DPR developed health screening levels for these pesticides to place the results in a health-based context. Although not regulatory standards, these screening levels can be used in the process of evaluating the air monitoring results. A measured air level that is below the screening level for a given pesticide would not be considered to represent a significant health concern and would not generally undergo further evaluation, but also should not automatically be considered “safe” and could undergo further evaluation. By the same token, a measured level that is above the screening level would not necessarily indicate a significant health concern, but would indicate the need for a further and more refined evaluation. Significant exceedances of the screening levels could be of health concern and would indicate the need to explore the imposition of mitigation measures.

In 1996, Congress passed major pesticide food safety legislation. This legislation, the Food Quality Protection Act of 1996 (FQPA), made significant changes to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA). Among other provisions, the FQPA requires U.S. EPA to review existing pesticide food tolerances (legal limits for pesticides in food) and to include an additional “safety factor” of up to 10-fold to account for uncertainty in data relative to children. U.S. EPA generally sets the factor at 1-fold, 3-fold, or 10-fold, depending on the completeness and reliability of the data available to assess pre- or post-natal toxicity and depending on the potential for pre- or post-natal effects of concern. This additional factor has become known as the “FQPA factor” or “FQPA safety factor.” Although the U.S. EPA uses this factor for evaluating pesticide food tolerances and dietary risk, the factor is applied to all potential sources of exposure to children. They have also established the FQPA factors for pesticides in the course of preparing the RED for specific chemicals. DPR evaluated the results of this project by considering the “FQPA factor” in addition to the screening levels following discussions with the LAG and TAG. These recommendations were also available for public comment.

The uncertainty factor approach used in generating the screening levels implicitly assumes that there is a threshold below which the toxic effect will not occur. This approach is not appropriate for carcinogenic chemicals that have a non-threshold mechanism of action. For these chemicals, the chronic screening level does not include carcinogenic effects, and a cancer potency value is derived for that chemical. The carcinogenic risk of these compounds is evaluated using a low dose extrapolation (non-threshold mechanism). In such an approach, the risk of cancer from exposure to a chemical is determined from the cancer potency of the chemical and the human exposure to the chemical. For each monitored chemical that has carcinogenic effects, the cancer potency is presented along with the screening levels. Cancer potency is expressed in the units of (mg/kg-day)$^{-1}$. Cancer risk is expressed as a probability for the occurrence of cancer (e.g., 1 in 1,000,000 or 10$^{-6}$, 1 in 100,000 or 10$^{-5}$, etc). It is a standard default assumption that exposure to a carcinogen takes place over a lifetime, so the default respiratory rate for an adult is used (0.28 m$^3$/kg/day).
Screening Levels

Acrolein

The Department has initiated a risk assessment for acrolein and U.S. EPA has released an RED. Acrolein has extensive non-pesticidal (industrial) uses. In 2008, OEHHA modified its acute and chronic Reference Exposure Levels (RELs) for Acrolein as part of its Air Toxics Hot Spots program. These values have undergone external scientific peer review. OEHHA used eye irritation in a human exposure study to derive a 1-hour REL of 2.3 ug/m$^3$. The remaining RELs were set based on the occurrence of lesions of the respiratory epithelium in a rat inhalation study. In this study, rats were exposed by nose-only, 6 hours per day, 5 days per week, for 65 days. OEHHA set an 8-hour REL of 0.70 ug/m$^3$ and a chronic REL of 0.35 ug/m$^3$. Since the acute screening level is based on a 24-hour exposure, and the 8-hour and chronic RELs are so close, it is appropriate to use the chronic REL of 0.35 ug/m$^3$ as the acute (24 hour), subchronic, and chronic screening levels.

Carbon disulfide

Sodium tetrathiocarbonate is applied to soil, but converts to carbon disulfide, sodium hydroxide, hydrogen sulfide, and sulfur in the soil. Carbon disulfide exerts the pesticidal activity in the soil. Hydrogen sulfide and carbon disulfide can move to the air and can then move offsite. Carbon disulfide is also generated by the breakdown of metam sodium into MITC (methyl isothiocyanate). This screening level is set for carbon disulfide.

Carbon disulfide has extensive not-pesticidal uses and exposure sources. OEHHA has set acute and chronic RELs for carbon disulfide as part of the air Toxic Hotspots Program. OEHHA set an acute 6-hour REL of 6,200 ug/m$^3$ based on a rat inhalation developmental toxicity study. In this study, rats were exposed for 6 hours a day for gestation days 6-20. The NOAEL was 620 mg/m$^3$ for decreased fetal body weight. OEHHA applied an uncertainty factor of 10 to address interspecies variability and a factor of 10 to address intraspecies variability. The REL does not incorporate a factor to compensate for differences in breathing rates between rats and people. The 6-hour REL of 6,200 ug/m$^3$ can be multiplied by 6/24 to derive a 24-hour screening level of 1,550 ug/m$^3$.

OEHHA set a chronic REL of 800 ug/m$^3$ based on a study that evaluated people occupationally exposed (8-hour work day) to carbon disulfide. This study established an average LOAEL of 7.6 ppm for decreased nerve conduction. OEHHA used a benchmark concentration (BMC) and compensated for 24-hour exposure to establish a human equivalent concentration of 2.54 ppm. An uncertainty factor of 10 to account for intraspecies variation was applied, resulting in a REL of 0.254 ppm. OEHHA rounded this to 0.3 ppm (800 ug/m$^3$). 800 ug/m$^3$ were used as the subchronic and chronic screening levels.

Chloropicrin

In 2010, DPR completed an evaluation of chloropicrin as part of the Toxic Air Contaminant process. The risk assessment was peer reviewed by the Scientific Review Panel. The
assessment set RfCs for acute, subchronic, and chronic timeframes. These values will be used as the corresponding acute, subchronic, and chronic screening levels. A NOEL of 670 ug/m³ for maternal effects (mortality, nasal discharge, decreased body weight, discolored lungs) in a rabbit inhalation developmental toxicity study was used as the basis for a 24-hour acute RfC of 6.1 ug/m³ for children. A NOEL of 807 ug/m³ for rhinitis in a 90-day rat inhalation toxicity study was used as the basis for a subchronic RfC of 2.3 ug/m³ for children. A NOEL of 289 ug/m³ for bronchietasis (chronic dilation of the bronchi with violent coughing) in a chronic mouse inhalation toxicity study was used as the basis for a chronic RfC of 1.8 ug/m³ for children. The document also assessed cancer risk based on lung tumors in mice.

**Chlorothalonil**

U.S. EPA completed an RED on chlorothalonil in 1999. The RED addressed inhalation for all time periods with a NOAEL of 2 mg/kg (kidney toxicity, forestomach ulcers) in a two-year oral rat study, assuming 100% absorption. Using this NOAEL and a combined uncertainty factor of 100 (a factor of 10 to address interspecies variability and a factor of 10 to address intraspecies variability) results in a screening level of 34 ug/m³ for all time periods. U.S. EPA assigned a FQPA safety factor of 1X. U.S. EPA classified chlorothalonil as likely to be a human carcinogen by all routes of exposure (based on rat kidney tumors) and calculated a potency factor of 0.00766 (mg/kg/day)⁻¹. The RED uses both a potency factor and RfD approach for assessing carcinogenicity.

DPR completed a dietary RCD on chlorothalonil in 2004, which calculated a potency factor of 0.011 (mg/kg/day)⁻¹ for kidney tumors. This slightly higher potency factor was used in this analysis. Since the RCD is limited to dietary exposure, inhalation was not included. Inhalation exposure was evaluated in a comprehensive risk assessment (evaluates all routes of exposure and exposure scenarios) whose completion is pending completion of the non-dietary exposure analysis. The completion of this risk assessment could result in changes to the above screening levels.

**Chlorpyrifos**

U.S. EPA released a finalized RED in 2006. The RED addressed short-term and intermediate-term inhalation using the same subchronic rat inhalation study. Rats were exposed 6 hours per day, 5 days per week. The highest dose level was 297 ug/m³, and no effects were seen at any dose level, making 297 ug/m³ a health protective NOAEL. For an acute screening level, the 297 ug/m³ is adjusted by 6/24 to give a 24 hour NOAEL of 74 ug/m³ and a screening level of 1.2 ug/m³ (employs uncertainty factors of 10 each for inter and intraspecies uncertainty and corrects for differences in breathing rates). For the subchronic screening level, the value is adjusted by 5/7 to compensate for the 5 day out of 7-day exposure, leading to a screening level of 0.85 ug/m³. For chronic exposure, the IRED used a chronic oral dog study with a NOAEL of 0.03 mg/kg for cholinesterase inhibition. This leads to an RfD of 0.0003 mg/kg and a screening level of 0.51 ug/m³. U.S. EPA retained the FQPA safety factor of 10X.

U.S. EPA has assigned chlorpyrifos an “E” carcinogenicity classification, evidence of non-carcinogenicity.
Cypermethrin

U.S. EPA released a revised RED in 2008. The RED stated that the NOAEL of 0.01 mg/L (10 mg/m³) for body weight loss and salivation in a 21-day subchronic inhalation study in rats should be used to assess inhalation exposure scenarios of all durations. The RED also stated that an uncertainty factor of 3X should be applied to the above NOAEL to estimate a chronic NOAEL. In the study, exposure occurred 6 hours a day, 5 days a week. To estimate an acute 24-hour NOAEL, 10 mg/m³ is adjusted by 6/24, resulting in a NOAEL of 2.5 mg/m³. An adjustment of 5/7 results in a subchronic NOAEL of 1.8 mg/m³ for exposure 7 days a week. The application of the 3X factor results in a chronic NOAEL of 0.6 mg/m³. Applying a correction factor of 4.5 to the NOAELs will result in human equivalent acute, subchronic, and chronic NOAELs of 11.3, 8.1, and 2.7 mg/m³, respectively. Applying an uncertainty factor of 10 for interspecies variation and 10 for intraspecies variation results in acute, subchronic, and chronic screening levels of 113, 81, and 27 ug/m³, respectively. U.S.EPA applied a FQPA safety factor of 1X.

U.S. EPA has designated cypermethrin as a “C” carcinogenicity classification (possible human carcinogen) but did not derive a cancer potency value.

Diazinon

The values for these screening levels were taken from a U.S. EPA IRED released in 2004. In this document, U.S. EPA determined that inhalation for all time periods should be evaluated using a 21-day rat inhalation study. The study used inhalation exposures of 6 hours per day, 7 days a week for 21 days. The LOAEL in this study is 0.1 ug/L (100 ug/m³) for cholinesterase inhibition. U.S. EPA used a factor of 3 to derive a NOAEL from a LOAEL. Therefore, the NOAEL would be 33 ug/m³. Normalizing to a 24-hour exposure results in a NOAEL of 8.33 ug/m³ and a human equivalent NOAEL of 13.3 ug/m³. This results in an acute, subchronic, and chronic screening level of 0.13 ug/m³. U.S. EPA assigned a FQPA safety factor of 1X.

U.S. EPA has classified diazinon as “not likely to be carcinogenic to humans.”

1,3-dichloropropene (1,3-D)

DPR has set RfCs for 1,3-D to support its ongoing control measures. The acute RfC of 200 ug/m³ was calculated from the acute inhalation NOAEL of 10 ppm (6 hours per day) in rats, based on body weight reduction that is indicative of systemic effects. This RfC was calculated using a breathing rate for children of 0.46m³/kg/day as opposed to the current default value of 0.59 m³/kg/day. Using the value of 0.59 m³/kg/day would result in a value of 160 ug/m³. This latter value was used as the acute screening level.

The subchronic RfC of 150 ug/m³ was calculated from the subchronic inhalation NOAEL of 10 ppm (6 hours per day, 5 days per week) in rats, based on degeneration and necrosis in the nasal epithelium. This RfC was calculated using a breathing rate for children of 0.46m³/kg/day as opposed to the current default value of 0.59 m³/kg/day. Using the value of 0.59 m³/kg/day would result in a value of 120 ug/m³. This latter value was used as the subchronic screening level.
The chronic RfC of 150 ug/m$^3$ was calculated from the chronic inhalation NOAEL of 5 ppm (6 hours per day, 5 days per week) in mice, based hyperplasia and hypertrophy of the respiratory epithelium and hyperplasia of the urinary bladder mucosa. This RfC was calculated using a breathing rate for children of 0.46 m$^3$/kg/day as opposed to the current default value of 0.59 m$^3$/kg/day. Using the value of 0.59 m$^3$/kg/day would result in a value of 120 ug/m$^3$. This latter value was used as the chronic screening level.

1,3-D is classified as a probable human carcinogen by U.S. EPA and is listed as a carcinogen under Proposition 65. DPR has calculated a cancer potency of 0.055 (mg/kg/day)$^{-1}$, based on the occurrence of bronchoalveolar adenomas observed in male mice in a chronic inhalation study.

**Dichlorvos (DDVP)**

At the time DPR developed the dichlorvos screening level for the Parlier project, the U.S. EPA had scheduled an RED for release. In 2001, U.S. EPA U.S. released a risk assessment for the RED. The RED has since been released. The risk assessment specified the use of a NOAEL of 0.1 mg/kg from an oral rabbit developmental toxicity study (maternal mortality, decreased weight gain, and cholinergic signs) to evaluate short-term inhalation. This NOAEL would result in an acute screening level of 1.7 ug/m$^3$. (U.S. EPA used an uncertainty factor of 100 X, excluding the FQPA factor, for all exposure periods.) The risk assessment specified the use of a NOAEL of 0.05 mg/kg from an oral dog chronic toxicity study (cholinesterase inhibition) to evaluate intermediate-term inhalation. This NOAEL would results in a subchronic screening level of 0.85 ug/m$^3$. The risk assessment specified the use of a NOAEL of 50 ug/m$^3$ (inhibition of brain cholinesterase) in a chronic rat inhalation study. Exposure took place 23 hours a day, 7 days a week. The amortized NOAEL is 48 ug/m$^3$, and the resulting screening level would be 0.77 ug/m$^3$. U.S. EPA assigned a FQPA factor of 3X and classified DDVP as having suggestive evidence of carcinogenicity.

DPR completed a RCD for DDVP in 1996, with two subsequent addenda. In the RCD, DPR evaluated acute inhalation exposure using the NOAEL of 1250 ug/m$^3$ (cholinergic signs) in a rabbit inhalation developmental toxicity study. Exposure took place 23 hours a day, 7 days a week. Amortizing the exposure to 24 hours results in a NOAEL of 1200 ug/m$^3$. Using this NOAEL and a rabbit breathing rate of 0.54 m$^3$/kg/day and a 100 X uncertainty factor results in an acute screening level of 11 ug/m$^3$. The same study, but with the lower NOAEL 250 ug/m$^3$, was used to evaluate subchronic inhalation. This NOAEL would result in a subchronic screening level of 2.2 ug/m$^3$. The RCD used the same chronic inhalation study as was described for the U.S. EPA risk assessment, resulting in the chronic screening level of 0.77 ug/m$^3$. The DPR also developed a potency factor of 0.35 (mg/kg/day)$^{-1}$ based on leukemia in the rat. Since they were based on inhalation studies, the screening levels from the DPR RCD were used.

**Dicofol**

U.S. EPA completed a RED on dicofol in 1998. To evaluate short-term inhalation exposure, the RED uses a NOAEL of 4 mg/kg for increased abortions from an oral rabbit developmental toxicity study. This NOAEL results in an acute screening level of 68 ug/m$^3$. To evaluate intermediate-term inhalation exposure, the RED uses a NOAEL of 0.29 mg/kg for inhibition of
ACTH release from a 90-day oral dog study. This NOAEL results in a subchronic screening level of 49 ug/m³. To evaluate long-term inhalation, the RED uses a NOAEL of 0.12 mg/kg for release of ACTH release from a chronic oral dog study. This NOAEL results in a chronic screening level of 20 ug/m³. U.S. EPA assigned dicofol a carcinogen classification of C, possible human carcinogen, but recommended an RfD approach for assessing risk. U.S. EPA assigned an FQPA factor of 3X.

**Dimethoate**

U.S. EPA completed an RED for Dimethoate in 2006. The RED specified that the results of a 21-day rat inhalation study on omethoate should be used to evaluate acute and subchronic inhalation exposure to Dimethoate. Omethoate is the more toxic oxygen metabolic of dimethoate, so its use would be health protective. In the study, rats were exposed by nose 6 hours per day, 5 days per week, for 3 weeks. U.S. EPA used a benchmark dose extrapolation to determine a point of departure. The BMCL₁₀ for inhibition of brain cholinesterase calculated as 0.38 mg/m³. This value is adjusted by 6/24 resulting in a 24 hour value of 0.095 mg/m³. A further adjustment of 5/7 yields a subchronic value of 0.068 mg/m³. An uncertainty factor of 10X can be used to estimate a chronic value of 0.0068 mg/m³. Applying a correction factor of 4.5 to the BMCL₁₀s will result in human equivalent acute, subchronic, and chronic values of 0.43, 0.30, and 0.030 mg/m³, respectively. Applying the conventional total uncertainty factor of 100 will result in acute, subchronic, and chronic screening levels of 4.3, 3.0, and 0.30 ug/m³, respectively.

**Diuron**

U.S. EPA completed an RED on diuron in 1993. To evaluate short-term inhalation, the assessment uses a NOAEL 10 mg/kg for maternal toxicity in a rabbit developmental toxicity study. Applying this NOAEL, an uncertainty factor of 10 to address interspecies uncertainty, and a factor of 10 to address intraspecies uncertainty results in an acute screening level of 170 ug/m³. To evaluate intermediate-term inhalation, the assessment uses a NOAEL 1.0 mg/kg for altered hematological values in the first 6 months of a chronic oral rat study. Applying this NOAEL, an uncertainty factor of 10 to address interspecies uncertainty, and a factor of 10 to address intraspecies uncertainty results in a subchronic screening level of 17 ug/m³. To evaluate long-term inhalation, the assessment uses a LOAEL 1.0 mg/kg for altered hematological values in the same chronic oral rat study. U.S. EPA applied an uncertainty factor of 3 to estimate a NOAEL of 0.33 mg/kg. Applying this NOAEL, an uncertainty factor of 10 to address interspecies uncertainty, and a factor of 10 to address intraspecies uncertainty results in a subchronic screening level of 5.7 ug/m³. U.S. EPA classified diuron as a likely human carcinogen (based on bladder and kidney tumors in rats and mammary tumors in mice) and derived a potency value of 0.0191 (mg/kg/day)^⁻¹. U.S. EPA assigned an FQPA factor of 1X.

**Endosulfan**

DPR completed a risk assessment on endosulfan in 2008 under the Toxic Air Contaminant program. A 21-day rat inhalation study (nose only, 6 hours per day) was used as the basis for evaluating acute, subchronic, and chronic inhalation. Toxic effects in this study included various
clinical signs of neurotoxicity and other signs of ill health (e.g. decreased body weight and food consumption). Using this study, the risk assessment established acute, subchronic, and chronic RfCs of 3.3, 3.3, and 0.33 ug/m$^3$, respectively. These values will be used as the corresponding screening levels.

**EPTC**

U.S. EPA completed an RED on EPTC in 1998. DPR has completed a RCD on EPTC. To evaluate short-term exposures, the RED used a NOAEL of 58 mg/m$^3$ for myocardial degeneration (heart muscle damage) from a 90-day rat inhalation study with exposure 6 hours per day, 5 days peer week. This NOAEL results in an acute screening level of 230 ug/m$^3$. To evaluate intermediate-term exposures, the RED used the same study. For exposures of less than 21 days, the RED used the above NOAEL, which results in a subchronic screening level of 170 ug/m$^3$. For intermediate-term exposures greater than 21 days, the RED used the same study, but a NOAEL of 8.3 mg/m$^3$ for clinical signs. This NOAEL results in a subchronic screening level of 24 ug/m$^3$. The RED did not select a value for evaluating long-term inhalation. The DPR RCD used an estimated NOAEL of 0.5 mg/kg/day for neuromuscular degeneration from a two-year oral rat study. This NOAEL converts to a chronic screening level of 8.5 ug/m$^3$. U.S. EPA has classified EPTC as not likely to be carcinogenic to humans. U.S. EPA assigned a FQPA factor of 10X.

**Malathion**

U.S. EPA released a revised RED on Malathion in 2009. Inhalation exposure was evaluated based on the results of a 90-day rat inhalation study in which rats were exposed 6 hours per day, 5 days per week. The lowest dose in the study, 100 mg/m$^3$, was a LOAEL based on histopathological effects in the respiratory epithelium, and a NOEL for plasma and RBC cholinesterase inhibition. U.S. EPA recommended the use of this study to evaluate short term and intermediate term inhalation exposure and used a factor of 10 to derive an estimated NOAEL of 10 mg/m$^3$ for the histopathological effects. Using this derived NOAEL, adjusting for the 6-hour per day exposure results in an acute NOEL of 2.5 mg/m$^3$. Adjusting for exposure 5 days per week will result in a subchronic NOEL of 1.79 mg/m$^3$. The RED did not have an evaluation of chronic inhalation. One approach would be to apply an additional uncertainty factor of 10X to the subchronic NOEL for a chronic NOEL of 0.179 mg/m$^3$. Applying the correction factor of 4.5 to the NOAELs will result in human equivalent acute, subchronic, and chronic NOAELs of 11.25, 8.06, and 0.81 mg/m$^3$, respectively. Applying an uncertainty factor of 10 for interspecies variation and 10 for intraspecies variation results in acute, subchronic, and chronic screening levels of 112.5, 80.6, and 8.1 ug/m$^3$, respectively. U.S.EPA applied a FQPA safety factor of 1X.

**Metam Sodium/MITC**

While metam sodium is the active ingredient that is applied in agricultural settings, it converts to fumigant methyl isothiocyanate (MITC), which moves into the ambient air. Therefore, screening levels are set for MITC. DPR has completed a RCD on metam sodium and MITC. The RCD has undergone scientific peer review and has been accepted by the SRP. RELs were set in the RCD and reviewed by the SRP. DPR calculated an acute REL of 22 ppb (66 ug/m$^3$) based on eye
irritation in a study of human volunteers. DPR set a subchronic REL of 1 ppb (3 ug/m³) based on nasal epithelial atrophy in rat subchronic inhalation study. DPR set a chronic REL of 0.1 ppb (0.3 ug/m³) based on the same subchronic rat study, but employing an uncertainty factor of 10X to address the uncertainty of using a subchronic value for chronic exposure. While metam sodium is classified by U.S. EPA as a probable human carcinogen, U.S. EPA has categorized MITC as having insufficient data for carcinogenicity classification. In the RCD, DPR concluded that the data were not sufficient to support a quantitative assessment of carcinogenicity. U.S. EPA did not assign a FQPA factor to MITC. The above RELs were used as the screening levels.

**Methyl Bromide**

DPR has completed an RCD for methyl bromide, which has undergone formal external peer review. RELs were set in the RCD. DPR calculated an acute REL of 210 ppb (820 ug/m³) based on developmental effects (NOAEL of 40 ppm) in a rabbit developmental toxicity study. DPR calculated an REL of 9 ppb (35 ug/m³) based on neurotoxic effects in a subchronic dog inhalation study designed to evaluate neurotoxicity. DPR calculated a chronic REL of 1 ppb (3.9 ug/m³) based on nasal epithelial hyperplasia and degeneration in a chronic rat inhalation study. U.S. EPA has classified methyl bromide as not likely to be carcinogenic to humans. U.S. EPA assigned a FQPA factor of 1X.

**Metolachlor**

U.S. EPA issued a Tolerance Reassessment Decision (TRED) on metolachlor and s-metolachlor in 2002. The TRED was based on a report of the U.S. EPA Hazard Identification Assessment Review Committee (HIARC) released in 2001. In this report, U.S. EPA specified the use of the NOAEL of 50 mg/kg (for clinical signs, decreased body weight gain, and decreased food consumption) in an oral rat developmental toxicity study with s-metolachlor, for assessing short-term inhalation exposure. U.S. EPA specified the use of the NOAEL of 8.8 mg/kg (for decreased body weight gain) in an oral dog subchronic toxicity study, for assessing intermediate-term inhalation exposure. U.S. EPA specified the use of the NOAEL of 9.7 mg/kg (for decreased body weight gain) in an oral chronic dog study with metolachlor for assessing long-term inhalation exposure. In all cases, U.S. EPA specified the use of a total uncertainty factor of 100X. This would result in acute, subchronic, and chronic screening levels of 85 ug/m³, 15 ug/m³, and 15 ug/m³, respectively. Since the subchronic screening level is slightly lower than the chronic screening level, it was used for both subchronic and chronic. U.S. EPA has classified metolachlor as a C, possible human, carcinogen, but has specified a non-linear MOE approach. U.S. EPA assigned a FQPA factor of 1X.

**Naled (Dichlorvos/DDVP)**

DPR completed a RCD on Naled in 1999 and an addendum in 2001. In the RCD, acute exposure, including inhalation, was evaluated using an estimated NOAEL of 2.5 mg/kg, based on neurotoxic effects in an oral rat Functional Observational Battery study. Subchronic exposure was evaluated using a NOAEL of 2.5 mg/kg (in terms of absorbed dose and amortized for daily exposure) for cholinesterase inhibition in a subchronic dermal rat study. Chronic exposure was evaluated using a NOAEL of 0.2 mg/kg for brain cholinesterase inhibition in a chronic rat study.
This would result in acute, subchronic, and chronic screening levels of 43 \text{ug/m}^3, 43 \text{ug/m}^3, and 3.4 \text{ug/m}^3, respectively.

In 2002, U.S. EPA released an RED on naled. In the RED, U.S. EPA used a NOAEL of 0.23 \text{mg/m}^3 for cholinesterase inhibition from a 13-week rat inhalation study to evaluate inhalation exposure of any duration. In this study, exposure took place 6 hours per day, 5 days per week. Adjusting for the 6-hour exposure and breathing rate differences results in a human equivalent NOAEL of 92 \text{ug/m}^3. Applying an uncertainty factor of 100 results in an acute screening level of 0.92 \text{ug/m}^3. Adjusting for exposures 5 days per week results in subchronic and chronic screening levels of 0.65 \text{ug/m}^3. U.S. EPA assigned a cancer classification of E, evidence of non-carcinogenicity and assigned a FQPA factor of 1X. Since the screening levels based on the RED are derived from an inhalation study, they were used here.

Norflurazon

U.S. EPA completed an RED in 1996 and a TRED in 2002. Neither document addressed inhalation exposure; therefore, the screening levels are set based on oral toxicity values. The TRED evaluated acute dietary exposure using the NOAEL of 10 \text{mg/kg/day} for increased skeletal variations in an oral rabbit developmental toxicity study. Using this NOAEL and a combined uncertainty factor of 100 results in an acute screening level of 170 \text{ug/m}^3. The TRED evaluated chronic dietary exposure using the NOAEL of 1.5 \text{mg/kg/day} for liver toxicity in a 6-month oral dog study. Using this NOAEL and a combined uncertainty factor of 100 results in chronic screening level of 26 \text{ug/m}^3. The TRED did not evaluate intermediate-term or subchronic exposure; therefore, the chronic screening level of 26 \text{ug/m}^3 was also used as the subchronic screening level. U.S. EPA classified norflurazon as a possible human carcinogen based on liver tumors, but did not recommend a quantitative risk assessment. U.S. EPA assigned an FQPA factor of 3X only for acute exposure of females 13-50 years of age, while assigning an FQPA factor of 1X for all other acute exposures and all chronic exposures.

Oryzalin

U.S. EPA completed an RED in 1994 and published a risk assessment in 2003, which will form the basis for a TRED. In the risk assessment, U.S. EPA specified evaluating short-term inhalation using the NOAEL of 25 \text{mg/kg} (maternal toxicity in an oral rabbit developmental toxicity study) and applying an uncertainty factor of 100X. This would result in an acute screening level of 420 \text{ug/m}^3. U.S. EPA specified evaluating intermediate-term and long-term inhalation using the NOAEL of 13.82 \text{mg/kg} (decreased weight gain, hematological effects, and thyroid effects in a chronic rat feeding study) and applying an uncertainty factor of 100X. This would result in a subchronic and chronic screening level of 230 \text{ug/m}^3. U.S. EPA classified oryzalin as likely to be carcinogenic to humans and assigned a slope factor of 0.00779 \text{ (mg/kg/day)^{-1}}. U.S. EPA assigned an FQPA factor of 1X.

Oxyfluorfen

U.S. EPA completed an RED in 2002. In the RED, U.S. EPA specified evaluating short-term inhalation using the NOAEL of 30 \text{mg/kg} (maternal toxicity in an oral rabbit developmental
toxicity study) and applying an uncertainty factor of 100X. This would result in an acute screening level of 510 ug/m³. U.S. EPA specified evaluating intermediate-term inhalation using the LOAEL of 32 mg/kg (liver toxicity a subchronic mouse feeding study), and applied an uncertainty factor of 3X to derive a NOAEL of 10.67 mg/kg. Applying an uncertainty factor of 100X results in a subchronic screening level of 180 ug/m³. U.S. EPA specified evaluating long-term inhalation using the NOAEL of 3.0 mg/kg (liver toxicity in chronic dog and mouse studies). Applying an uncertainty factor of 100X would result in a chronic screening level of 51 ug/m³. U.S. EPA classified oxyfluorfen as a possible human carcinogen based on liver tumors in mice and assigned a slope factor of 0.0732 (mg/kg/day)⁻¹. U.S. EPA assigned an FQPA factor of 1X.

Permethrin

U.S. EPA completed an RED on permethrin in 2005. In the RED, U.S. EPA specified using the NOAEL of 42 mg/m³ (neurotoxicity in a 15 day rat inhalation study) to evaluate short-term, intermediate-term, and long-term inhalation exposure. U.S. EPA applied an uncertainty factor of 100X. The study exposed animals 6 hours a day for an average of 3.75 days a week. Adjusting for exposure for 24 hours and differences in breathing rates results in a human equivalent acute NOAEL of 16.8 mg/m³. Applying the uncertainty factor of 100X results in an acute screening level of 168 ug/m³. Adjusting this value for exposure 3.75 days per week results in subchronic and chronic screening levels of 90 ug/m³. U.S. EPA classified permethrin as likely to be carcinogenic to humans based on lung tumors in mice and derived a slope factor of 0.00957 (mg/kg/day)⁻¹. U.S. EPA assigned an FQPA factor of 1X.

Phosmet

U.S. EPA completed an IRED for Phosmet in 2001. In the IRED and supporting risk assessment, U.S. EPA specified evaluating short-term inhalation using the NOAEL of 4.5 mg/kg (cholinesterase inhibition an acute rat oral neurotoxicity study) and applying an uncertainty factor of 100X. This would result in an acute screening level of 77 ug/m³. U.S. EPA specified evaluating intermediate-term inhalation using the NOAEL of 1.5 mg/kg (cholinesterase inhibition in an oral subchronic rat neurotoxicity study) and applying an uncertainty factor of 100X. This would result in a subchronic screening level of 26 ug/m³. U.S. EPA specified evaluating long-term inhalation using the NOAEL of 1.1 mg/kg (cholinesterase inhibition in an oral rat chronic toxicity study) and applying an uncertainty factor of 100X. This would result in a chronic screening level of 18 ug/m³. U.S. EPA classified phosmet as having suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential. U.S. EPA assigned an FQPA factor of 1X.

Propargite

U.S. EPA completed an RED on propargite in 2001. In the RED, U.S. EPA used a LOAEL of 310 mg/m³ (mortality in a 4-hour rat inhalation study) to evaluate short-term, intermediate term, and long-term inhalation. The RED specified a total uncertainty factor of 1000X. This included a 10X factor due to the lack of a NOAEL, the severity of effects at the lowest dose tested, and the 4-hour exposure duration. Adjusting for differences in human and rat breathing rates and using this 1000X uncertainty factor would result in a screening level of 496 ug/m³ for all timeframes.
U.S. EPA has classified propargite as a probable human carcinogen based on intestinal tumors in rats. The RED specified a cancer potency factor of 0.0033 (mg/kg/day)$^{-1}$. U.S. EPA assigned an FQPA factor of 1X.

DPR completed an RCD on propargite in 2004. In the RCD, DPR derived an acute RfC of 14 ug/m$^3$ based on maternal toxicity at 2 mg/kg in a rabbit developmental, an oral absorption rate of 40%, and an uncertainty factor of 100. DPR derived a chronic RfC of 26 ug/m$^3$ based decreased body weights and decreased food consumption at 3.8 mg/kg in a chronic rat study, an oral absorption rate of 40%, and an uncertainty factor of 100. The seeming incongruity of a chronic NOAEL higher than the acute NOAEL is probably the result of dose selection. Since the current process is intended to develop screening levels, a conservative approach would be to use the lower acute value to examine all time periods. For propargite, the screening level of 14 ug/m$^3$, derived from the acute RfC was used for evaluating acute, subchronic, and chronic exposures. In the RCD, DPR calculated cancer potency values in a range of 0.0059 to 0.026 (mg/kg/day)$^{-1}$.

**SSS-tributyltriphosphorotrithioate (DEF)**

In 1999, DPR completed an RCD on DEF that was peer reviewed by the SRP. The RCD derived an acute and subchronic REL of 8.8 ug/m$^3$ based on cholinesterase inhibition and clinical signs in a 90-day rat inhalation study. Since DEF is not used year round, chronic inhalation exposure was not evaluated. DPR derived a carcinogenicity potency factor of 0.084 (mg/kg/day)$^{-1}$. In a 1999 IRED, U.S. EPA specified the use of the same study to evaluate short-term and intermediate term exposure. The RED also did not evaluate long-term inhalation exposure. U.S. EPA classified DEF as a likely high dose/not likely low dose carcinogen and recommended that a potency factor not be calculated. U.S. EPA retained the FQPA factor of 10X.

**Simazine**

U.S. EPA released an RED on simazine in 2006. The RED evaluated short-term inhalation using a NOAEL of 6.25 mg/kg from a 28-day oral pubertal study in rats. This NOAEL results in an acute screening level of 110 ug/m$^3$. The RED recommended evaluating intermediate-term and long-term inhalation exposure using a NOAEL of 1.8 mg/kg from an oral 6-month luteinizing hormone surge study in rats. This NOAEL results in both subchronic and chronic screening levels of 31 ug/m$^3$. U.S.EPA classified simazine as not likely to be carcinogenic to humans and assigned an FQPA factor of 3X.

**Trifluralin**

U.S. EPA completed an IRED on trifluralin in 2004. The IRED assessed short-term inhalation was assessed using a NOAEL of 300 mg/m$^3$ for methemoglobinemia and clinical signs in a 30-day rat inhalation study in which exposure took place 6 hours a day, 5 days a week. The amortized 24-hour NOAEL would be 75 mg/m$^3$. Adjusting for differences in rat and human breathing rats and applying a total uncertainty factor of 100X results in an acute screening level of 1,200 ug/m$^3$. Intermediate-term inhalation was assessed using a NOAEL of 10 mg/kg for kidney and urine chemistry effects in an oral rat urinalysis study. This would convert to a subchronic screening level of 170 ug/m$^3$. Long-term inhalation was assessed using a NOAEL of
2.4 mg/kg for decreased body weight, decreased red blood cells, and other hematological effects in an oral chronic dog study. This would convert to a chronic screening level of 41 ug/m³. U.S. EPA classified trifluralin as a C, possible human carcinogen and derived a cancer potency value of 0.0058 (mg/kg/day)^{-1}. U.S. EPA assigned an FQPA factor of 1X.

OTHER POSSIBLE CANDIDATES FOR MONITORING

**Acephate**

DPR completed a RCD in 2008, but air exposure was not a significant part of the overall exposure and reference concentrations were not set. U.S.EPA released an RED in 2006. In that document, the results of a 4-week rat inhalation study were specified to evaluate inhalation exposures of any duration. Rats were exposed 6 hours per day, and it is assumed they were exposed 5 days per week. The NOAEL was 1.064 mg/m³ for brain cholinesterase inhibition. U.S.EPA assigned an FQPA value of 1X. These values lead to the calculation of acute, subchronic, and chronic NOAELs of 0.266, 0.19, and 0.19 mg/m³, and human equivalent NOAELs of 1.20, 0.85, and 0.85 mg/m³, respectively. Applying the uncertainty factor of 100X leads to the calculation of acute, subchronic, and chronic screening levels of 12.0, 8.5, and 8.5 ug/m³, respectively.

**Bensulide**

U.S.EPA released an RED in 2006. The RED specified the use of a NOAEL of 5.5 mg/kg for maternal plasma cholinesterase inhibition in a rat oral developmental toxicity study as the basis for assessing short-term inhalation. The RED specified the use of a NOAEL of 0.5 mg/kg for plasma cholinesterase inhibition in a chronic oral dog study as the basis for assessing intermediate-term inhalation. The RED did not address chronic or long-term inhalation; however, since the dog study was chronic, it would be appropriate for chronic inhalation. The RED specified an FQPA factor of 1X and an overall uncertainty factor of 100X. Applying uncertainty factor of 100 and the RfD to RfC conversion factor of 4.7 results in acute, subchronic, and chronic screening levels of 259, 24, and 24 ug/m³ respectively.

**Chlorthal dimethyl (Dacthal, DCPA)**

U.S.EPA completed an RED on chlorthal dimethyl in 1998. Acute and subchronic toxicity were not addressed because they were not a concern (due to low toxicity). The RED used a NOAEL of 1.0 mg/kg for thyroid effects in a chronic oral rat study to assess chronic dietary exposure. An oral rabbit developmental toxicity study had a NOEL of 500 mg/kg (highest dose tested). This value will be used to assess acute exposure. A 90-day rat oral subchronic toxicity study had a NOEL of 10 mg/kg for liver effects, and this will be used to assess subchronic toxicity. The RED used an FQPA value of 1X and an overall uncertainty factor of 100X. Therefore, the acute, subchronic, and chronic NOELs to be used are 500, 10, and 1.0 mg/kg respectively. Applying the uncertainty factor of 100X and the RfD to RfC conversion factor of 4.7 results in acute, subchronic, and chronic screening levels of 23,500, 470, and 47 ug/m³ respectively.

**Iprodione**
An RED was completed on iprodione in 1998. The RED specified the use of a NOAEL of 20 mg/kg for developmental effects in a rat oral developmental toxicity study as the basis for assessing short-term inhalation. The RED specified the use of a NOAEL of 6.1 mg/kg for histopathological lesions in the male reproductive system and adrenal effects in males and females in a chronic oral rat study as the basis for assessing intermediate-term inhalation. The RED did not address chronic or long-term inhalation; however, since the rat study was chronic, it would be appropriate also for chronic inhalation. The RED specified an FQPA factor of 3X and an overall uncertainty factor of 100X. Applying uncertainty factor of 300X (does not include the FQPA factor) and the RfD to RfC conversion factor of 4.7 results in acute, subchronic, and chronic screening levels of 939, 286, and 286 ug/m^3 respectively. U.S.EPA has classified iprodione as a likely human carcinogen with a potency factor of 4.39 x 10^-2 (mg/kg/day)^1.

**Methidathion**

DPR completed a risk assessment of methidathion in 2007 as part of the Toxic Air Contaminant process. The assessment set RfCs for the acute, subchronic, and chronic timeframes. A NOEL of 0.18 mg/kg in a 90-day oral rat study for brain cholinesterase inhibition after 2 weeks was used as the basis for an acute RfC of 3.1 ug/m^3. This same value was used for the subchronic RfC. A NOEL of 0.15 mg/kg for liver effects in a 1-year oral dog study was used as the basis for a chronic RfC of 2.5 ug/m^3. U.S.EPA assigned an FQPA value of 1X and classified methidathion as a possible human carcinogen.

**Oxydemeton-methyl**

An RED was completed on oxydemeton-methyl in 2006. The RED and the supporting risk assessment specified the use of the results of a 4-hour acute inhalation study (with no NOEL) as the basis for assessing inhalation exposures of all durations. This could be viewed as an over-extrapolation. Therefore, the studies used by the RED to assess acute and chronic dietary exposure will be used as the basis for evaluating inhalation exposures of differing duration. A LOAEL of 2.5 for cholinesterase inhibition in a rat oral acute neurotoxicity study was used as the basis for assessing acute dietary exposure. The RED used an uncertainty factor of 3X to account for the use of a LOEL, for a total uncertainty factor of 300X. A NOAEL of 0.013 mg/kg for decreased brain cholinesterase in a 1-year oral dog study was used, along with an uncertainty factor of 100X, as the basis for assessing and chronic exposure. This value will also be used to assess subchronic exposure. The RED specified an FQPA factor of 1X. Applying the uncertainty factors and the RfD to RfC conversion factor of 4.7 results in acute, subchronic, and chronic screening levels of 39.2, 0.61, and 0.61 ug/m^3 respectively.
MEMORANDUM

TO: Randy Segawa
Department of Pesticide Regulation
California EPA
P.O. Box 4015
Sacramento, CA 95812-4015

FROM: Gabriele Windgasse, DrPH
Staff Toxicologist, Human and Ecological Risk Office (HERO)
Department of Toxic Substances Control
California EPA
8800 Cal Center Drive
Sacramento, CA 95826

DATE: November 5, 2010

SUBJECT: Review of the “Air Monitoring Network Study: Long-Term Ambient Air Monitoring for Pesticides in Multiple California Communities” (Draft), published by the Department of Pesticide Regulation (DPR) in September 2010

PCA: 95155 (Cal/EPA Assignments/MP)

Document Reviewed

Per your request, the Human and Ecological Risk Office (HERO) has reviewed the September 2010 draft of the “Monitoring Network Study: Long-Term Ambient Air Monitoring for Pesticides in Multiple California Communities”. The document was distributed at the September 16, 2010 meeting to members of the Pesticide Regulation and Evaluation Committee (PREC) for review by October 9, 2010.

Scope of Review

HERO has reviewed this document with emphasis on those aspects that affect the risk to human health. Minor grammatical or typographical errors that do not alter the interpretation of the report have not been noted.
Background

The Department of Pesticide Regulation (DPR) proposes monitoring the air concentration of 39 pesticides, fumigants and breakdown products (Tables 1 and 2) in three locations in California: Ripon (population 10,146; San Joaquin County, 20 miles south of Stockton); Shafter (population 12,736; Kern County, 18 miles west-northwest of Bakersfield) and Salinas (population 151,060; Monterey County, 15 miles north-east of Monterey). These locations were selected because the surrounding areas report heavy use of pesticides and the presence of relatively large sensitive sub-populations (< 18 years; > 65 years; people with disabilities; people working in farming, fishing or forestry industries). The proposed sampling and analysis plan is based on previous DPR studies in Lompoc (Santa Barbara County) and Parlier (Fresno County) of up to 12 months.

The project is designed to measure the ambient air concentration for three years: 24-hour samples will be collected once a week at each location and 24-hour air concentrations (ng/m3 and ppb) will be calculated based on the air volume pulled through the sampling medium and the pesticide analyses of the absorbent medium. The measured concentrations of pesticides in air will be adjusted to seasonal levels (average concentration during peak use season for each pesticide and at each location) and chronic levels (average concentration over 1 year for each pesticide and location). These concentrations will be compared to human health screening levels to determine "what, if any, action to take". These health screening levels are not regulatory standards; rather, DPR uses them to evaluate the air monitoring results. The sources of the human health screening levels are Risk Characterization Documents (RCD) from DPR, the DPR Toxicology Database, Re-registration Eligibility Documents (RED) by USEPA and Reference Exposure Levels (REL) by OEHHA and peer-reviewed by the Toxic Air Contaminant (TAC) Scientific Review Panel. Table 4 of the document provides a summary of the health screening levels (acute screening level; subchronic screening level, chronic screening level). An air concentration below the respective screening level would not be considered a significant health concern, but also should not automatically be considered "safe". An air concentration above the screening level would indicate the need for further evaluation.

DPR asked for comments on the following concerns:
1. Sampling schedule: how to select which days to sample
2. Quality control: what type of QC samples should be collected and how often (co-located samples and/or analyses by other organizations; frequency of duplicate samples; field spikes; field blanks; audits)
3. Reporting frequency and the use of pesticide use report (PUR) data and evaluation in the report (reporting lag of 9 – 15 months)
4. Reporting data to U.S. EPA Air Quality System (AQS)
5. Proposed sampling locations in each community
6. Comments on the updated health screening levels
7. Methods to evaluate cumulative exposures
HERO limits its comments to concerns 5, 6 and 7.

General Comments

DTSC agrees in principle with the proposed air monitoring plan and the objective to monitor air concentrations of pesticides to determine ambient inhalation exposures for communities, including exposure of sensitive subpopulations. However, in HERO’s opinion, several significant concerns are associated with the proposed study that could limit its value for the evaluation of health impacts from airborne pesticides. These concerns are specified below.

Specific Comments

1. DPR Concern 5: Sampling Locations in Communities
   Based on the figures, maps and aerial photos provided in the document, the Ripon sampling location is fairly centrally located in the community, but off-center in the communities of Shafter and Salinas. The Shafter and Salinas locations are in predominantly down-wind locations; i.e. the air will have travelled from the agricultural use areas over most of the communities before reaching the sampling locations, and the measured concentrations maybe biased low. In addition, Shafter’s proposed location is at the local airport, which may be influenced from unusual air movements (starting and landing of aircraft). In HERO’s opinion, the Shafter location is marginally acceptable, whereas Salinas and Ripon are acceptable. HERO recommends considering adding a second air monitoring station in (predominantly) upwind areas of the Shafter and Salinas communities: this could provide an indication of the pesticide deposition in the community.

   DPR response:
   The location in Shafter has been moved to the northeast section of the community.

2. DPR Concern 6: Health Screening Levels
   HERO did not review the appropriateness of the proposed health screening levels for the 39 proposed pesticides, fumigants and breakdown products. Rather, HERO has two comments on the approach of measuring air concentrations of pesticides for the evaluation of the inhalation exposure of a residential community: the lack of aerosol/particle information and the lack of distinction between two health outcomes, cancer risk and non-cancer hazard
   a. Particulate matter/aerosol
      HERO is concerned that the information on pesticide inhalation exposure is not complete unless information is included on pesticides absorbed or adsorbed in solid or liquid particles (aerosol). Measuring only the concentration of pesticides in the gaseous fraction will not be a true representation of the inhalation pathway. HERO believes that a minor change in the sampling protocol (collection of PM10 and PM2.5, wet and dry depositions) and subsequent analyses for pesticides would quantify this portion of the exposure pathway. After summing the air concentration and
particulate matter contribution for each pesticide, the concentration could be compared to the screening levels.

b. Cancer risk vs. non-cancer hazard
DTSC recommends clearly defining the health outcomes that are used to estimate toxicity: Risk refers to a statistical response in a population, most often used to estimate potential cancer risks (given as an estimated cancer rate, for example 1 in one million or 1E-06). Hazard refers to the potential of a substance to cause adverse health effects, also referred to as the “non-cancer hazard”. HERO believes that the toxicity of the pesticides to be monitored warrants the distinction between these two toxic effects: some evidence for carcinogenicity is listed in Appendix B for 16 out of 39 pesticides: Cypermethrin – possible human carcinogen; 1,3-dichloropropene – probable human carcinogen; dichlorvos – suggestive evidence of carcinogenicity; dicofol – possible human carcinogen; diuron – likely human carcinogen; metolachlor – possible human carcinogen; norflurazon – possible human carcinogen; oryzalin – likely human carcinogen; oxyfluorfen – possible human carcinogen; permethrin – likely human carcinogen; phosmet – suggestive evidence of carcinogenicity; propargite – probable human carcinogen; SSS-tributyltributylphosphinotrithioate – likely high dose, not likely low dose carcinogen; trifluralin – possible human carcinogen; iprodione – likely human carcinogen; methidathion – possible human carcinogen.

Based on the toxicity information presented, cancer slope factors or cancer potency factors are not available for most of these compounds and the quantification of the cancer risk is not possible at this point. HERO recommends evaluating the potential carcinogens at least qualitatively, by listing them in a separate section of the report with their airborne concentrations and the evidence of carcinogenicity for each. It should be stated clearly that the potential cancer risk is unknown due to the absence of cancer slope factors, and that only non-cancer hazards were quantitatively evaluated.

DPR Concern 7: Methods to evaluate cumulative exposures
HERO recommends evaluating the cumulative cancer risk (if available) and non-cancer hazard with a similar spreadsheet as the OEHHA-developed Hazard-Risk Calculator for the California Human Health Screening Levels for soil and soil gas (CHHSL: http://oehha.ca.gov/risk/Sb32soils05.html).

DPR response:

We appreciate the comments from the DTSC Human and Ecological Risk Office.

We do disagree with the characterization of “risk” and “hazard.” Hazard refers to the inherent toxicological characteristics of a chemical, in which exposure plays no role. Hazard is used to characterize both cancer and non cancer effects. Risk is a characterization (may be qualitative or quantitative) of the potential for the hazard to
occur under various exposure scenarios. It is generally accepted that risk assessment encompasses both non-threshold and threshold effects. The risk for non-threshold effects (e.g., cancer, in the absence of sufficient evidence to the contrary) is, as is asserted by the comments, quantitatively described by a statistical incidence in a population. However, it is also common and accepted practice to quantitatively describe threshold events by a Margin of Exposure (MOE). Both are quantitative and legitimately characterize risk. DPR will examine the described risk-calculator spreadsheet to see if it offers advantages over the spreadsheet approach that was used in past air monitoring projects.

In the derivation of the screening levels, the various USEPA cancer classifications are given. Cancer risk is generally calculated using a potency value when the chemical under consideration has been classified as a “probable human carcinogen” (or the equivalent depending on the classification system). Cancer risk may also sometimes be quantified in this way when the chemical in question has been classified a “possible human carcinogen,” depending on the strength of the evidence. In some cases, carcinogenic risk may be assessed using a threshold approach (MOE) if the evidence so indicates.

In the documentation, DPR has indicated the cancer classifications and the cancer potency values (when they have been established). Cancer studies have been conducted and are on file at DPR for the pesticide active ingredients that will be monitored. Cancer potency values are available and are presented for the “probable human carcinogens.” To avoid confusion with the non-cancer effects, screening levels have not been generated for non-threshold carcinogenic effects. However, as in past air evaluations, cancer risk can be calculated for those “probable human carcinogens” monitored in the air. The cancer risk from these compounds will not be unknown. Both non-cancer and cancer risk can be quantitatively assessed. However, the purpose of the air monitoring network is not to specifically conduct a risk assessment on each compound, but to measure the concentration of pesticides in the air. It is a monitoring project, not a risk assessment project.

**Conclusion and Recommendations**

HERO believes that the proposed study will be very valuable for determining and evaluating exposure to pesticides in ambient air in rural communities. However, if the intention of the air monitoring is to estimate pesticide inhalation exposure of the residential population and certain sensitive sub-populations, DTSC believes that the proposed measurements will likely underestimate the exposure, since exposure to particle- or aerosol-bound pesticides is not included in the evaluation. This limitation of the study should be clearly stated or could be resolved by including collection and analyses of this airborne fraction. HERO recommends including the qualitative evaluation of suspected carcinogens, in addition to the quantitative, cumulative evaluation of non-cancer effects.

If you have additional questions please contact me at Tel. 916-255 4332, or email: gwindgas@dtsc.ca.gov

Reviewed by: Claudio Sorrentino, PhD
Senior Toxicologist, Northern California Unit Chief
Human and Ecological Risk Office, DTSC
November 8, 2010
TO: Randy Segawa and Pam Wofford, DPR
FROM: Anne Katten, CRLA Foundation
cc. Teresa De Anda, Susan Kegley, Karl Tupper

RE: Comments on Air Monitoring Network Study in Multiple Communities, September 2010 Draft

Thank you for providing the opportunity to comment. These comments are intended to supplement the phone discussion we had which also included Tom Frantz and Teresa De Anda.

Overall I appreciate the level of detail and transparency shown in this proposal. The diagrams which show use levels for fumigants, organophosphates and other active ingredients and windspeed distributions around the proposed sites are very informative.

Site Selection

I recognize that it is challenging to find suitable monitoring sites but I encourage you to work with ARB to try to locate alternate sites in Shafter and Salinas which are located where pesticide air concentrations representative of higher end exposures for the community are predicted from both meteorological conditions and agricultural pesticide use patterns. I hope you have been able to follow up on the suggestions made by Tom Franz regarding alternative Shafter site selection.

**DPR response:**
The site in Shafter has been changed to a location near the northeast section of the city.

Monitoring Schedule

I recommend a monitoring schedule that randomly alternates between monitoring on Tuesday, Wednesday and Thursday and possibly Friday in order to obtain a representative sample of air levels during the week.

**DPR response:**
Text has been added to address the randomization of sample start.
Health Screening Levels

This study plan should state that Health Screening Levels may be subject to update or revision because of new toxicity data or further evaluation by DPR, OEHHA or USEPA. Appendix B states that the chlorothalonil screening level may be updated when the DPR inhalation risk assessment is completed but this should also be stated more generally in the body of the plan. We may have additional comments on health screening levels at a later date. Health screening levels do not have to be chosen before monitoring is conducted.

**DPR response:**

*Updating of Health Screening Levels:* Health screening levels will be updated, as appropriate, to accommodate new data. This is especially important, given the open ended nature of the monitoring program.

Screening levels should be set to incorporate any FQPA factor which has been developed. For example screening levels for chlorpyrifos and diazinon should be set lower to incorporate the FQPA factors.

**DPR response:**

*We acknowledge the FQPA safety factors, but given the fact that they may be changed by USEPA and do not cover all situations, we do not incorporate them into the screening levels. This is consistent with our past practices. However, also consistent with our past practices, we consider the FQPA safety factor when evaluating the significance of measured air levels. This was very clear in the Parlier report, where the monitored numbers were considered both with and without the application of the FQPA factor- specifically for chlorpyrifos and diazinon. This approach will not change.*

Appendix B states that a cancer potency factor is provided for each chemical that has carcinogenic effects. The cancer potency factor for chloropicrin of 2.2 (mg/kg/day)-1 and negligible risk factor of 0.24 ppt set forth in the TAC report should therefore be added to this study plan and the appendix entry for chloropicrin.

**DPR response:**

*In the derivation of the screening levels, the various USEPA cancer classifications are given. Cancer risk is generally calculated using a potency value when the chemical under consideration has been classified as a “probable human carcinogen” (or the equivalent depending on the classification system). Cancer risk may also sometimes be quantified in this way when the chemical in question has been classified a “possible human carcinogen,” depending on the strength of the evidence. In some cases, carcinogenic risk may be assessed using a threshold approach (MOE) if the evidence so indicates. In the documentation, DPR has indicated the cancer classifications and the cancer potency values (when they have been established). Cancer studies have been conducted and are on file at DPR for the pesticide active ingredients that will be monitored. Cancer potency values are available and are presented for the “probable human carcinogens.” To avoid confusion with the non-cancer effects, screening levels have not been generated for non-threshold carcinogenic effects.*
However, as in past air evaluations, cancer risk can be calculated for those “probable human carcinogens” monitored in the air.

Appendix B does not mention that for methyl bromide OEHHA has derived a lower subchronic REL of 1 ppb for children based on neurotoxic effects from a different subchronic dog inhalation study and an intermediate level has been used by DPR for regulatory purposes. As a precautionary approach, the lower REL should be utilized as a screening level for this study.

**DPR response:**

*Methyl Bromide: DPR will use the subchronic methyl bromide REL that it generated and used in its risk assessment. This value was also used by USEPA.*

Thank you for the opportunity to comment.
Randy,

At the last PREC meeting on September 16, you gave a presentation on DPR's plan to establish a three-site pesticide monitoring network. During your presentation, you requested comments on several aspects of the plan by the next PREC meeting, which is scheduled for November 9, 2010. We reviewed the plan and have the following comments:

1. Sampling schedule - The plan calls for collecting one 24-hour sample per week at each of the three sites. While collecting a sample every six days is ideal to ensure there is no bias by over or under-selecting certain days of the week, we recognize that collecting samples on weekends requires overtime. We suggest collecting samples on random days of the work-week (e.g., Tuesday one week and Wednesday the next week). Ideally, samples at all three sites should be collected on the same day, but this is not essential.

   **DPR response:**
   *Text has been added to address the randomization of sample start. Due to limited manpower, all three sites may not be sampled on the same day.*

2. Sampling locations - DPR selected three towns for the pesticide monitoring network: Ripon, Shafter and Salinas. DPR has now selected specific monitoring sites in each of these towns. We are concerned that the monitoring sites that have been selected may not be consistent with the monitoring objectives stated in the plan. We have the following concerns:

   a) Ripon - While the town of Ripon is surrounded by pesticide use as indicated in your plan, it is located relatively close to the delta and receives stronger winds than towns farther south in the San Joaquin Valley. These winds will act to disperse concentrations, leading to lower air concentrations at the Ripon monitoring site than if the same emissions of pesticides were upwind of a town with less wind. We suggest considering a town similarly impacted by pesticide emissions that is located farther south in the San Joaquin Valley.

   **DPR response:**
   *The main consideration for selection of a community was based on amount of historical pesticide use. Ripon was selected above other communities based on the surrounding pesticide use.*

   b) Shafter - Prevailing winds in Shafter are from the northwest. The site selected for monitoring in Shafter is located in the southeast portion of Shafter. Concentrations of pesticides will drop as the air disperses across the town prior to reaching the monitoring site. We suggest attempting to find a site in the north or northwest portion of Shafter, which will likely have higher concentrations of pesticides from applications upwind of Shafter.
**DPR response:**

The site in Shafter has been changed to a location near the northeast section of the city.

c) Salinas - Similar to Ripon, concentrations of pesticides in Salinas will likely be lower than towns farther south in the Salinas Valley due to dispersal by the winds, which are stronger in Salinas than farther south in the Salinas Valley. The site selected for monitoring in Salinas is in the southeast corner of the city, about three miles from the west edge of town. The prevailing winds are from the west and northwest, so concentrations of pesticides will drop as the air disperses across the city prior to reaching the monitoring site. We understand that there may still be value in conducting monitoring in Salinas. However, DPR should consider noting in the plan that higher air concentrations may exist in the smaller towns of the Salinas Valley where dispersal by the wind is less of a factor.

**DPR response:**

Salinas was selected due to high fumigant and nonfumigant use. The use of fumigants is much lower in the Salinas Valley.

3. Analytical quantitation limits - Table 3 lists the approximate detection and quantitation limits of the monitoring methods. Based on ARB's prior monitoring of some of the pesticides on DPR's list, we are concerned that some of the quantitation limits may not be sufficiently sensitive to allow DPR to report quantifiable results. For example, the detection limit for chlorothalonil is listed as 13.7 ng/m³, with a quantitation limit of 92.6 ng/m³. The maximum concentration measured previously by ARB in a county of high use during a month of high use was 14 ng/m³. We suggest checking with the CDFA laboratory to see if there is any way to decrease the quantitation limit for several of the pesticides in Table 3 or if the factor can be decreased between the detection limit and the quantitation limit.

**DPR response:**

The multi-residue screen makes it difficult to get lower quantitation limits. The alternative is to do separate sampling for individual pesticides which would result in prohibitive costs or the loss of the number of communities monitored and number of days sampled. All of the quantitation limits are below the health screening levels.

4. Quality control - We suggest that DPR establish data quality objectives with regard to quality control samples, with acceptance criteria that would prompt re-evaluating sampling and analysis procedures if the criteria are not met. With regard to frequency of quality control samples, we suggest collecting collocated samples at each site at least once per month, along with monthly quality control samples (lab spikes, blanks and replicate analyses, and field spikes and blanks).

**DPR response:**

Text has been added to the protocol to describe the frequency of the collection of quality control samples. The quantity of lab quality control samples you suggested would exceed 25% of the total number of samples and greatly increase the cost of the study.
5. Quality assurance audit - ARB's Quality Assurance Section has committed to being available to conduct a field and lab audit early in 2011, after your monitoring has started.

**DPR response:**
*We appreciate the assistance. Text has been added to the protocol.*

6. Reporting of findings - While reporting monitoring results with pesticide use data allows for more interpretation of monitoring results, due to the delay in obtaining the use data, we suggest summarizing monitoring results by site on a quarterly basis and presenting this information on the DPR web site. Once the use data are available, the monitoring results can be updated for monthly or quarterly summaries of results compared against use data. We also suggest that you ask U.S. EPA for their recommendation with regard to reporting the data on the U.S. EPA Air Quality System.

**DPR response:**
*DPR staff and management will discuss this suggestion.*

Thank you for the opportunity to provide comments on the draft plan. Please contact me with any questions.

Lynn

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DPR response to comment during PREC meeting 9/16/10

From: Randy Segawa
To: Patti TenBrook
Date: 9/16/2010 1:31:23 PM
Subject: Salinas sampling site

Patti

Sorry we misinterpreted your comment about the location of the Salinas sampling site for the air monitoring network. We considered establishing the sampling site in the northwest part of Salinas instead of the southeast part, and we should probably discuss. You are correct that a northwest site would be closer to fumigant applications, and there may be a feasible site in that area. We have proposed the airport in the southeast part of Salinas for the following reasons:

1) It is closer to organophosphate applications.

2) We still expect a high frequency of detection of fumigants. ARB's previous fumigant monitoring in the area had a high frequency of detection even at "control" sites. Fumigants appear to move further than other pesticides. We detected methyl bromide several times in Parlier even though there were no reported applications within 5 miles. Hopefully, we'll be able to use modeling or statistical analysis to account for the distances from applications.

3) The ag commissioner recommended the airport based on his local knowledge.

4) The airport site is ideal from an unobstructed air flow, access, and security perspective. Plus, we are collocated with a NWS meteorological station.

Ann - The other PREC members may find Patti's suggestion, and my response useful.

Randy