Chloropicrin Mitigation Measures

Control of Resident and Bystander Acute Exposure From Soil Fumigation Applications

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Background

The Department of Pesticide Regulation (DPR) will require mitigation measures designed to protect bystanders (persons near an application site but not directly involved with the application) and residents from off-site exposure to chloropicrin. (NOTE: See Appendix 1 for a list of all acronyms.)

Chloropicrin is widely used as a field fumigant injected into the soil or applied through drip irrigation. The treated field is generally covered with a tarp at or before application. For broadcast applications, the tarp is removed several days later after the fumigant has dissipated. For drip and bedded applications, the tarp is left on the field during the entire growing season. Holes are punched in the tarp for planting after the fumigant has dissipated. Chloropicrin is used either alone or in combination with other fumigants. In addition to its fumigant pesticidal properties, chloropicrin is also added (about two percent by weight) as a warning agent to odorless products that contain methyl bromide, and as a warning agent to structures just prior to the application of sulfuryl fluoride. These mitigation measures do not address chloropicrin use as a warning agent either in soil fumigants (products containing 2% or less chloropicrin) or in structural fumigations.

Following field fumigations, chloropicrin rapidly diffuses through the soil in all directions, then dissipates quickly, with half-lives ranging from approximately an hour to several days. Dissipation is faster at higher temperatures, and slower in oxygen-depleted conditions. Volatilization is the major pathway through which chloropicrin dissipates from soil, although tarps can significantly reduce volatilization. In water, chloropicrin can persist for several days in the absence of light, but it degrades rapidly when subjected to light of suitable wavelengths, with half-lives ranging from 6 hours to 3 days. In air, chloropicrin is reactive, primarily undergoing photolytic reactions. Laboratory photolysis studies suggest that chloropicrin degrades rapidly in sunlight, with an estimated half-life in the range of 3 – 18 hours under constant illumination, and results in photo-degradation products including phosgene and ozone.

DPR completed a Risk Characterization Document (RCD) for chloropicrin as a toxic air contaminant (TAC) in February 2010. Focusing on residents and bystander exposure, the RCD assessed the health risk of chloropicrin based on evaluations of toxicology studies, and exposure estimates from air monitoring, computer modeling, and other data. In December 2010, DPR issued a Risk Management Directive instructing staff to develop measures to restrict chloropicrin exposures to 73 ppb averaged over an eight-hour period. After chloropicrin was designated as a TAC effective January 8, 2011, DPR staff initiated development of use restrictions following the TAC procedures specified in state law that includes consultation with the Office of Environmental Health Hazard Assessment, the California Department of Food and Agriculture, the Air Resources Board, the Air Pollution Control Districts, and the County Agricultural Commissioners (CAC).

Scientific and Regulatory Basis

United States Environmental Protection Agency (U.S. EPA) Reregistration Eligibility Decision

In July 2008, U.S. EPA published the document, “Reregistration Eligibility Decision (RED) for Chloropicrin, opening a public comment period on the implementation aspects of the risk mitigation measures they were requiring as conditions of reregistration.

After reviewing the comments and new data, U.S. EPA determined that the main risk of concern for handlers, workers, and bystanders associated with the soil uses of chloropicrin is from acute inhalation exposure as a result of volatilization of the fumigant. In May 2009, after consulting with stakeholders and obtaining extensive public input, U.S. EPA issued an Amended RED for the soil fumigant pesticides, including chloropicrin. The Amended RED incorporated final new safety measures to increase protections for agricultural workers and bystanders. These measures establish a baseline for safe use of the soil fumigants throughout the United States, reducing fumigant exposures and significantly improving safety. Measures added to labels in the first phase, Phase 1 of implementation, included Fumigant Management Plans, good agricultural practice requirements, and new worker protection measures among other things. Phase 1 labels took effect in January 2011.

A final set of soil fumigant product label changes went into effect on December 1, 2012, implementing new protections primarily for bystanders and residents. The amended product labels incorporate the second and final phase of mitigation measures required by the U.S. EPA's 2009 RED for the soil fumigants, including chloropicrin. The new measures appearing on soil fumigant Phase 2 labels include buffer zones and posting, emergency preparedness and response measures, training for certified applicators supervising applications, Fumigant Management Plans, and notice to State Lead Agencies who wish to be informed of applications in their states. A summary of these requirements are described in Appendix 2.

DPR Determinations

As described in DPR's RCD, chloropicrin can cause eye, nose, throat, and upper respiratory irritation. Results from a chloropicrin human sensory irritation study (Cain, 2004) indicate that eye irritation is the most sensitive effect. Most of the study participants detected chloropicrin within 20-30 minutes at 150 parts per billion (ppb). Twenty percent of the individuals reported some eye discomfort at 100 ppb, and 40 percent of the individuals reported increasing discomfort at 150 ppb. U.S. EPA selected a reversible acute endpoint from this human study, and determined a benchmark concentration level of 73 ppb. At this level U.S. EPA does not expect eye or nose irritation, or upper respiratory changes. The studies concluded that the acute effects of chloropicrin seen at the 100 ppb level are mild and reversible, and that acute effects of eye irritation are not expected at 73 ppb. DPR agrees with U.S. EPA that the primary effect observed with acute exposure to chloropicrin is sensory irritation, and has determined that the appropriate regulatory target level to restrict acute exposure to chloropicrin is 73 ppb averaged over an eight-hour period. DPR established this health-protective level based on its RCD and U.S. EPA's RED, as well as additional information. For example, DPR considered the National Institute of Occupational Safety and Health's reference exposure level of 100 ppb averaged over an eight hour period.

In December 2010, DPR issued a Risk Management Directive (Appendix 3), directing staff to develop use restrictions on pesticide products containing the active ingredient chloropicrin to mitigate unacceptable acute exposures to residents and bystanders. Although acute effects of eye irritation are to be expected, reversible, and necessary when used at the levels of a warning agent, protection of residents and bystanders against those effects could be attained when chloropicrin is used as an active ingredient in soil fumigations.

Scope of DPR Mitigation Strategy

The mitigation measures discussed in this document are designed to protect bystanders and residents from acute exposures to chloropicrin, both as the sole active ingredient and when used in conjunction with methyl bromide or 1,3-D as an active ingredient in soil fumigations. These mitigation measures do not address chloropicrin use as a warning agent either in soil fumigants (products containing 2% or less chloropicrin) or in structural fumigations. As stated in the December 31, 2010 Risk Management Directive, the target level for this mitigation effort is to limit acute exposure to no more than 73 ppb averaged over an eight-hour period.

Mitigation Measures

These mitigation measures were developed using U.S. EPA label changes (Appendix 2) as the foundation for mitigating acute exposures to bystanders and residents. The U.S. EPA safety measures went into effect after DPR completed its RCD and therefore were not considered when estimating bystander's exposure to chloropicrin. DPR also considered applicable California regulations, application methods, use patterns, CAC permit conditions, and incident cases to justify the additional restrictions, such as reduced maximum acreage treated within a 24-hour period.

In addition to consulting with other state and local agencies as required by law for the development of these mitigation measures, DPR also discussed early mitigation concepts with worker advocate groups and registrants. Based on an initial analysis of data and options, DPR proposed mitigation measures in May 2013 for public comment. DPR also submitted its initial technical analysis for scientific peer review. DPR received comments from several thousand people and three peer reviewers. After evaluating all of the public and peer review comments, DPR assessed several new options and updated its technical analysis (memorandum from Terrell Barry to David Duncan, dated October 31, 2014, Appendix 4). Based on its final evaluation, DPR will implement the following additional restrictions beyond labeling and regulation to protect residents and bystanders.

1. **Buffer zone distances**: The methods used to determine buffer zone distances and related requirements are described in detail in DPR's buffer zone development document (Appendix 4), and summarized here. As with other fumigants, DPR used air monitoring data and computer modeling to determine the buffer zones. Data from air monitoring of specific application sites was used to estimate chloropicrin emissions (flux) during and following fumigations. The flux values were input into a computer model to estimate air concentrations under a variety of conditions. Buffer zones were determined by calculating the distance from the fumigated area to the 73 ppb target concentration for different combinations of application rates, acreage, and weather conditions. In addition to describing the methods used to calculate the buffer zone distances, Appendix 4 also describes the changes to the buffer zone analysis from the May 2013 proposal. The major changes include data corrections, revised fumigation method groupings, and evaluating and using weather data from additional locations.

   The corrections resulted in smaller buffer zones than those proposed in May 2013. The errors are discussed in detail in Appendix 4, but in summary they consisted of:

   - Night atmospheric stability values incorrectly assigned to daylight hours for some of the Ventura County weather data.
   - Reporting errors in the air sampling times for several studies, resulting in different

times of day that peak flux occurred.
- Incorrect application rates assigned to two flux studies.

Buffer zone development was based on chloropicrin application studies that were used to estimate flux profiles for different fumigation methods. DPR's original analysis described in the May 2013 mitigation proposal grouped fumigation methods only by tarp type, and there were no statistically significant differences in flux for other application parameters, such as bed vs. broadcast application. There were also insufficient data to determine if the fluxes for applications using tarps assigned 20% or 40% buffer credit were significantly different from other tarps. The tarp groupings remain the same as the May 2013 mitigation proposal:

- Tarps assigned a 60% buffer zone credit by current labels and DPR (also known as totally impermeable film, or TIF tarp)
- Tarps assigned a buffer credit of less than 60% by current labels (referred to in this document as non-TIF tarp)
- Untarped

As described above and in Appendix 4, DPR corrected several errors in the flux studies and weather data used to calculate the buffer zones. These error corrections resulted in fumigation method groupings that were not apparent in the original analysis. DPR's final fumigation method groupings are similar to those described by labels and DPR's requirements for other fumigants, and are based on air concentration and flux measurements from 28 applications.

1. TIF tarp broadcast shank injection
2. TIF tarp bed injection
3. TIF tarp strip deep injection
4. TIF tarp drip
5. Non-TIF tarp broadcast shank injection
6. Non-TIF tarp bed injection
7. Non-TIF tarp strip injection
8. Non-TIF tarp drip
9. Untarped broadcast shallow shank injection
10. Untarped broadcast deep shank injection
11. Untarped bed injection
12. Untarped drip

DPR's original analysis described in the May 2013 mitigation proposal used five years of weather data from Ventura County to determine buffer zone distances. For an application with a particular combination of acreage and application rate the buffer zone distance actually needed will vary depending on weather conditions. Shorter buffer zones are required to mitigate off-site air concentrations when weather conditions are breezy or there is a high degree of vertical mixing of air such as during warm summer days. To better characterize the variation in air concentrations and buffer zones due to weather, DPR evaluated weather data from four other counties in addition to Ventura: Kern, Monterey, San Joaquin, and Siskiyou counties. DPR selected these counties because:

- They are in high-use regions of chloropicrin.
- They represent different geographic areas.
- They have complete weather data for a 5-year period.

DPR calculated the buffer zone distances for the fumigation methods and locations listed above. DPR input all of the available flux data for each fumigation method and weather data for each of the five locations into a computer model to estimate the maximum downwind distance at which 73 ppb occurred for several thousand hypothetical applications, accounting for a wide range of weather conditions and flux. The model showed that the buffer zone distance (distance to 73 ppb) varied greatly. For example, DPR made approximately 12,000 estimates of the buffer zone distance for a non-TIF broadcast shank application to a 40-acre field at 350 pounds per acre. The downwind distance to 73 ppb (buffer zone) for this scenario ranged from 0 to 2000+ feet. Buffer zones based on Ventura County weather data were the largest, with 50% of the hypothetical applications having a distance of less than 60 feet, and 95% of the applications having a distance of less than 523 feet. Buffer zones for Ventura County were consistently larger than the other four locations. The buffer zones for the other four locations were similar, with no location consistently different for all fumigation methods.

In consultation with the Air Resources Board, DPR has developed two sets of buffer zones based on the weather data, one set of buffer zones for coastal counties and a second set for inland counties. Buffer zones for coastal counties are based on Ventura County weather data, and inland counties are based on San Joaquin County data. Ventura County had consistently larger buffer zones than Monterey, so its selection adds a level of protection for most areas. For the inland counties, no single location had consistently larger buffer zones. Siskiyou County was not selected because of a greater number of days with long periods of calm winds, causing greater uncertainty in the computer modeling. San Joaquin County was selected over Kern County because of higher use of chloropicrin. These two sets of buffer zones account for most of the differences in regional weather conditions and are consistent with DPR's coastal/inland approach for methyl bromide buffer zones.

In the May 2013 mitigation proposal, DPR included buffer zone distances for the 80th to 95th percentiles of protection. The percentiles represent the frequency or probability of exceeding the 73 ppb target concentration beyond the perimeter of the buffer zone. Consistent with other fumigants, DPR's final chloropicrin buffer zone distances are based on the 95th percentile. The 95th percentile means that the maximum air concentration beyond the perimeter of the buffer zone is no greater than the 73 ppb target concentration on average for 95 percent of all applications. The buffer zone distances vary with four factors: region (coastal or inland), application method, application rate, and number of acres fumigated. (Buffer zone credits are addressed in the next section.) The application rate is adjusted if only portions of a field are fumigated. Usually an entire field is fumigated prior to planting (flat or broadcast fumigation). In some cases, such as certain orchards, only the planting rows are fumigated (strip fumigation). Similarly, sometimes a field is fumigated after forming the planting beds, and only the bedded portions of the field are fumigated (bed fumigation). For strip, bed, and drip fumigations, the application rate is adjusted to account for the fumigated and unfumigated areas. For example, a flat field of 40 acres could be entirely fumigated at a broadcast rate of 150 pounds per acre, resulting in a total amount of 40x150 = 6,000 pounds of chloropicrin applied. The same 40 acre field could be fumigated after forming beds. If the bed width is 32 inches, and the row spacing is 48 inches, the beds comprise 32÷48 = 67 percent of the 40-acre field. An application rate of 150 pounds per acre to the beds is a "broadcast-equivalent" rate of 150x0.67 = 100 pounds per acre, resulting in a total amount of 100x40 = 4,000 pounds of chloropicrin applied. A comparison of the buffer zone distances for this example is shown in Table 1.

Tables 2 – 13 show DPR's buffer zone distances for selected application rates and acres. The final buffer zone tables will show distances for finer divisions of application rates and acres. As indicated by the example above and Tables 2 – 13, some of DPR's buffers are larger and more restrictive than the ones currently specified by labels. Some of DPR's *calculated* buffer zones are smaller than the ones specified by labels. In these cases, DPR's *required* buffer zones will default to the label distances.

DPR considered, but did not establish different buffer zones for different seasons. All other factors being equal, air concentrations are higher and buffer zones are larger during winter than other seasons due to longer nights causing more stable atmospheric conditions. The difference in buffer zone distances between seasons is minimal, and is outweighed by the added complexity to the requirements. See Appendix 4 for details on the seasonal analysis.

U.S. EPA followed similar procedures to develop the buffer zones for label requirements. However, some of the flux data DPR used was not available to U.S. EPA at the time they developed the label requirements. Also, DPR used weather data specific to California while U.S. EPA used weather data representative nationwide.

2. **Buffer zone credits:** DPR's evaluation of the buffer zone credits specified by labels remains the same as described in the May 2013 mitigation proposal and indicates the following:
    - Tarps with 60% credit: data supports greater credit
    - Tarps with 40% credit: additional data needed to allow buffer credit
    - Tarps with 20% credit: additional data needed to allow buffer credit
    - "Symmetry" application rig credit: additional data needed to allow buffer credit
    - Potassium thiosulfate credit: additional data needed to allow buffer credit
    - Water treatment credit: additional DPR evaluation in progress
    - Organic content credit: additional DPR evaluation in progress
    - Soil temperature credit: additional DPR evaluation in progress
    - Clay content credit: additional DPR evaluation in progress

    DPR's evaluation of data for TIF tarps shows they are more effective in reducing emissions than recognized by the 60% buffer zone credit currently specified by labels. This conclusion is based in part upon data that was unavailable to U.S. EPA at the time they assigned the label buffer credits. Therefore, DPR will follow the 60% buffer credit specified by U.S. EPA on labels.

    There are an insufficient number of field studies to statistically evaluate the difference in flux for the 40% credit tarp, as well as the 20% credit tarp, "Symmetry" application rig, and potassium thiosulfate amendment. However, DPR continues to conduct additional research to evaluate the effectiveness and assess enforceability of the other credits, including the credits for water treatment, organic content, soil temperature, and clay content.

3. **Approved tarps:** Tarps assigned a 60% buffer credit will require both U.S. EPA and DPR approval. DPR's approval process will provide an evaluation of tarps and deny use if found to be unacceptable.

4. **Minimum buffer zones:** In May 2013, DPR proposed minimum buffer zones of 25 feet for

TIF applications and 60 to 100 feet for non-TIF and untarped applications. For field fumigations of chloropicrin-only and in combination with 1,3-D, the following minimum buffer zones are similar to the proposal:

TIF: 25 feet
Non-TIF applications no greater than 6 acres: 60 feet
Non-TIF applications greater than 6 acres: 100 feet
Untarped: 100 feet

For fumigations of chloropicrin in combination with methyl bromide, the minimum methyl bromide buffer zones apply as required in regulation.

The computer modeling shows that no buffer zone is required for certain fumigations (buffer distance zero feet). However, the computer modeling employs simplifying assumptions, including the use of square fields and uniform flux across the entire field. Fumigations with significant deviations from these model input conditions (e.g., spots with higher and lower flux across the field) could have buffer zone distances that differ from the corresponding modeled fumigation. Although the use of the 95th percentile buffer zone mitigates much of the variability, DPR has specified minimum buffer zones to provide additional protection.

5. **Additional DPR restrictions for emergency preparedness and response measures:** These requirements remain the same as described in the May 2013 proposal, but with some clarifications. Conditions which trigger emergency preparedness are identified on the product labeling. The certified applicator can choose to either conduct fumigant site monitoring, or to provide response information for neighbors. In addition to what is required by the labeling, DPR will require the following additional restrictions for these options.

   - "Response information for neighbors" option: The information must be provided in both English and Spanish.

   - "Fumigant site monitoring" option: The following additional restrictions were included in the May 2013 proposal, but some are clarified:
     - Monitor for sensory irritation at the outer edge of the buffer zone.
     - Monitoring must be done in the direction of residences, businesses, and bystanders, and in the direction that the wind is blowing, at a minimum of two locations.
     - Monitoring on calm days (i.e. when wind speeds are forecasted to drop below 5 miles per hour and/or when field observation confirms the same) must be done in the direction of bystanders, residences and businesses, as well as at each side of the fumigated field.
     - Sensory irritation monitoring is limited to persons with full olfactory capabilities (e.g. not impaired by allergies or colds).
     - At the start of each monitoring period, wind direction must be determined and recorded on the Post-Application Summary.

   For fumigations of chloropicrin in combination with methyl bromide, regulations require notification similar to "response information for neighbors" described above.

6. **Emergency response plan**: The May 2013 proposal did not include revisions to the emergency

response plan. Labels require an emergency response plan and it must identify: evacuation routes, locations of telephones, contact information for first responders and government agencies, and emergency procedures and responsibilities. In addition to these items, DPR will require that the certified applicator notify the CAC immediately if the plan is implemented.

7. **Notice of intent requirements**: These requirements remain the same as described in the May 2013 proposal. The operator of the property to be treated must submit a notice of intent (NOI) to the CAC at least 48 hours before the fumigation begins. Besides including the date of application, the NOI must also include the time the fumigation is scheduled to begin. The fumigation cannot begin sooner than the time listed on the NOI, and must begin within 12 hours of the scheduled time. If fumigation does not begin within the 12 hour window, a new NOI must be submitted. The CAC can determine if another 48 hour waiting period is needed.

8. **Maximum acreage and overlapping buffer zones**:
   - The maximum acres to be treated at one location (a single application block) within a 24 hour period must not exceed 40 acres for non-TIF tarp and untarped applications, and 60 acres for TIF* tarp applications. In May 2013, DPR proposed a maximum of 40 aces for all applications, but the updated analysis indicates that DPR's *calculated* TIF tarp buffer zones are less than minimum distance for larger blocks.

     *For chloropicrin fumigations in combination with methyl bromide, the 40-acre maximum applies as required in regulation.

   - Labels prohibit overlapping buffer zones unless a minimum of 12 hours elapses from the time the first application block is complete until the start of a second application block.

   - DPR will require additional restrictions for overlapping buffer zones. For non-TIF tarp and untarped applications with overlapping buffer zones, if less than 36 hours elapse from the time one application block is complete until the start of another application block, the buffer zones must be recalculated based on the combined acreage of the chloropicrin application blocks with overlapping buffer zones. The combined acreage cannot exceed 40 acres.

   - For TIF tarp applications, DPR's *calculated* buffer zones are all less than the minimum distance of 25 feet. TIF applications with overlapping buffer zones do not need to be based on combined acreage, but the combined acreage cannot exceed 60 acres. If applications with TIF tarps have buffer zones that overlap with buffer zones from non-TIF tarp or untarped applications, the acreage of the TIF tarp applications are not combined with the other applications.

     NOTE: Labels require a buffer zone from the start of application until 48 hours after the application is complete. Buffer zones could overlap between 36 and 48 hours after application and the buffer zones would be calculated based on the individual block size (acreage not combined) and the combined acreage could exceed 40 acres.

9. **Tarp cutting**: These requirements remain the same as describe in the May 2013 proposal. Any application using tarps that qualify for a reduction in buffer zone distance (tarps with 60%, 40%, or 20% buffer credit) must wait a minimum of 9 days after application before tarp cutting is

initiated. All tarps (whether they qualify for a buffer reduction credit or not) cannot be removed sooner than 24 hours after tarp cutting or perforation. Monitoring shows that tarps with buffer zone credits may have high flux if the tarps are cut too soon. The data shows that nine days is sufficient to ensure minimal flux during tarp cutting. Appendix 4 provides details on this analysis.

10. **Tree hole fumigations**: Labels require a buffer zone of 25 feet for tree hole fumigations, but with no limit on the number of holes that can be fumigated. DPR will limit the number of injection sites per acre, and maximum acreage that can be treated per day (application block). In May 2013, DPR proposed a limit of 160 to 230 holes/acre, for the 80th to 95th percentile and assumed all holes were for one acre. Appendix 4 describes the updated analysis for tree holes, based on the monitoring data for untarped deep injection fumigations. Table 14 shows the maximum number of tree holes and acreage. This is based on the 95th percentile and provides more flexibility for larger fields. If less than 36 hours elapse from the time the first application block is complete until the start of the next application block, the combined number of injection sites cannot exceed the values shown in Table 14.

11. **Fumigation time restrictions**: DPR did not propose any fumigation time requirements in the May 2013 proposal, but based on the analysis in Appendix 4 DPR will require that non-TIF tarp and untarped fumigations start no earlier than one hour after sunrise, and end no later than three hours prior to sunset. These requirements will help avoid the peak flux from occurring at night when air concentrations are generally higher due to inversions and more stable atmospheric conditions. TIF tarp applications have no time restrictions.

    These time restrictions and the selection of the 95th percentile for buffer zone distances will help address extreme weather conditions that can cause higher air concentrations, such as low inversion levels and calm winds for long periods. DPR will assist CACs in addressing other extreme weather conditions at the local level as part of the CACs' evaluation of restricted materials permits.

Table 1. Example comparison of calculated buffer zone distances for:
Field area (application block): 40 acres
Application rate for treated area: 150 pounds per acre
Bed area: 67% of field area (32 inch bed width, 48 inch row spacing)
Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

Application Method	Treated Area App Rate (lbs/ac)	Broadcast-Equivalent App Rate (lbs/ac)*	DPR Coastal Buffer (ft)	DPR Inland Buffer (ft)	Label Buffer (ft)
Untarped Broadcast Shallow	150	150	1974	1433	1038
Untarped Broadcast Deep	150	150	1363	956	760
Untarped Bed	150	100	817	782	350
Untarped Drip	150	100	997	997	997
Non-TIF Tarp Broadcast	150	150	179	179	179
Non-TIF Tarp Bed	150	100	417	287	25
Non-TIF Tarp Strip	150	100	417	287	136
Non-TIF Tarp Drip	150	100	100	100	40
TIF Tarp Broadcast	150	150	25	25	25
TIF Tarp Bed	150	100	25	25	25
TIF Tarp Strip Deep	150	100	54	54	54
TIF Tarp Drip	150	100	25	25	25

*The broadcast-equivalent application rate is used to determine the buffer zone.

Table 2. Buffer zone distances for untarped broadcast shallow shank injection. Labels limit the application rate to 175 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	227	420	703	928	1130
150	100	480	768	1231	1615	1974

DPR inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	150	283	476	636	782
150	100	344	561	900	1184	1433

Table 3. Buffer zone distances for untarped broadcast deep shank injection. Labels limit the application rate to 350 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	100	215	404	563	702
150	100	305	518	850	1120	1363
200	100	488	780	1254	1640	2032
250	136	662	1049	1629	2136	2633
300	247	817	1291	2025	2682*	3255*
350	328	976	1536	2367	3108*	3786*

DPR inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	100	129	264	367	462
150	100	206	356	587	783	956
200	100	350	572	913	1200	1455
250	129	493	772	1213	1582	1928
300	193	616	976	1540	2012	2417
350	248	749	1182	1811	2362	2910*

* Labels prohibit the application if the buffer zone is greater than 2640 feet (1/2 mile).

Table 4. Buffer zone distances for untarped bed shank injection. Labels limit the application rate to 265 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	227	420	703	928	1130
150	100	480	768	1231	1615	1974
200	180	704	1109	1730	2283	2792*
250	299	916	1438	2257	2916*	3573*

DPR inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	150	283	476	636	782
150	100	344	561	900	1184	1433
200	150	524	823	1301	1701	2065
250	226	696	1100	1709	2214	2700*

* Labels prohibit the application if the buffer zone is greater than 2640 feet (1/2 mile).

Table 5. Buffer zone distances for untarped drip. Labels limit the application rate to 100 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal and inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	100	183	389	660	851	997

Table 6. Buffer zone distances for non-TIF tarp broadcast shank injection. Labels limit the application rate to 350 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal and inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	100	100	100
150	60	60	100	100	100	100
200	60	61	139	207	272	354
250	60	129	204	303	407	499
300	60	165	265	395	495	625
350	60	215	315	475	610	725

Table 7. Buffer zone distances for non-TIF tarp bed shank injection. Labels limit the application rate to 265 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	218	322	417
150	60	159	332	571	774	951
200	60	337	573	916	1197	1464
250	60	479	777	1237	1616	1956

DPR inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	150	223	287
150	60	120	246	421	566	697
200	60	251	423	682	893	1086
250	60	366	588	934	1227	1485

Table 8. Buffer zone distances for non-TIF tarp strip shank injection. Labels limit the application rate to 265 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	218	322	417
150	60	159	332	571	774	951
200	60	337	573	916	1197	1464
250	60	479	777	1237	1616	1956

DPR inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	150	223	287
150	60	120	246	421	566	697
200	60	251	423	682	893	1086
250	60	366	588	934	1227	1485

Table 9. Buffer zone distances for non-TIF tarp drip. Labels limit the application rate to 225 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	100	100	100
150	60	60	100	130	184	231
200	60	90	168	282	373	455

DPR inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	60	60	100	100	100	100
150	60	60	100	113	154	189
200	60	85	149	238	309	373

Table 10. Buffer zone distances for TIF tarp broadcast shank injection. Labels limit the application rate to 350 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal and inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	25	25	25	25	25	25
150	25	25	25	42	58	72
200	25	25	56	83	109	142
250	25	52	82	121	163	200
300	25	66	106	158	198	250
350	25	86	126	190	244	290

Table 11. Buffer zone distances for TIF tarp bed shank injection. Labels limit the application rate to 265 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal and inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	25	25	25	25	25	25
150	25	25	25	48	71	99
200	25	25	30	82	119	151
250	25	25	37	103	148	188

Table 12. Buffer zone distances for TIF tarp strip shank deep injection. Labels limit the application rate to 265 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal and inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	25	25	25	26	44	54
150	25	25	52	84	120	138
200	25	39	76	121	164	204
250	25	48	94	152	206	254

Table 13. Buffer zone distances for TIF tarp drip. Labels limit the application rate to 225 pounds/acre for this method. Values in black are distances currently required by labels. Values in red are DPR's larger, more restrictive distances.

DPR coastal and inland buffer zones (feet)

Broadcast Equivalent Application Rate (lbs/ac)	1 ac	5 ac	10 ac	20 ac	30 ac	40 ac
100	25	25	25	25	25	25
150	25	25	30	52	70	88
200	25	25	40	69	93	117

Table 14. Tree hole fumigation restrictions.

Maximum Number of Holes Per Acre	Maximum Application Block Size (ac)
50	40
75	10
100	5
200	1

Chloropicrin tree hole fumigations in combination with methyl bromide cannot exceed 1 acre as required by regulations.

Appendix 1

List of Acronyms

1,3-D – 1,3 - dichloropropene

ac – acre

app – application

CAC – County Agricultural Commissioner

DPR – Department of Pesticide Regulation

ft - feet

NOI – Notice of Intent

lbs/ac – pounds per acre

ppb – parts per billion

RCD – Risk Characterization Document

RED – Reregistration Eligibility Decision

TAC – toxic air contaminant

TIF – totally impermeable film

U.S. EPA – United States Environmental Protection Agency

Appendix 2

U.S. EPA Mitigation

U.S. EPA developed mitigation measures for products containing the active ingredient chloropicrin. These measures are intended to mitigate unacceptable exposures to workers and residents and bystanders. The measures have been implemented in two phases.

Phase 1 Changes that Went Into Effect December 31, 2010:

- **Restricted Use Pesticide Classification:** U.S. EPA reclassified all of the soil fumigants undergoing reregistration as restricted use pesticides.
- **Agricultural Worker Protection:** Persons engaged in activities that are part of the fumigation process are considered "handlers", with specific requirements and restrictions in place on the label.
- **Handler Training Information:** U.S. EPA required fumigant registrants to develop training information and materials for fumigant handlers working under the supervision of the certified applicator in charge of fumigation. The certified applicator must provide this information to each handler, or confirm that the handler has received the information within the past 12 months.
- **Handler respiratory protection:** In general, if handlers experience sensory irritation they must either stop work and leave the area or use air-purifying respirators to protect them from unsafe levels. Air monitoring (using a direct read detection devise) is required while handlers use respirators to ensure concentrations do not exceed the upper working limit of respirators. All handlers who will wear a respirator must be fit-tested, trained, and medically examined to ensure they do not have health problems that could make use of a respirator dangerous. An air purifying respirator with the appropriate cartridges must be available for each handler who will wear a respirator.
- **Tarp handling:** There are specific time limitations on when tarps can be perforated and removed, with a minimum of 5 days from completion of the application to protect workers from unsafe levels (if a weather condition exists that necessitates early removal, persons removing the tarp must wear the PPE required for handlers on that label).
- **Entry-restricted period (ERP):** The ERP is similar to the restricted entry interval (REI), but is intended to restrict inhalation exposure, whereas the REI is intended to restrict dermal exposure. Entry into treated fields (including early entry that would otherwise be permitted under the WPS) by any person other than a trained and equipped handler is prohibited from the start of the application until the ERP has expired.
- **Good Agricultural Practices:** Many good agricultural practices recommended on older fumigant labels became mandatory on the new labels, such as proper soil preparation/tilling and soil moisture and temperature restrictions. These practices reduce off-site movement of the fumigant.
- **Application Method and Rate Restrictions:** Labels restricted certain fumigant application methods that lead to risks that are difficult to address, such as untarped applications for some fumigants. The labels also lowered the maximum application rates to reduce exposures to handlers and bystanders.

- **Site-Specific Fumigant Management Plans:** Labels required fumigant users to prepare a written, site-specific fumigant management plan (FMP) before fumigations begin. Only Phase 1 requirements are addressed. A post-fumigation application summary (PAS) is required within 30 days of completing the application. The certified applicator supervising the application must complete the PAS, which describes any deviations from the FMP that have occurred, measurements taken to comply with GAPs, monitoring results taken as because of handler sensory irritation, as well as any complaints and/or incidents that have been reported to him/her. Documentation of this information assists CACs in compliance activities and investigating episodes.

Phase 2 Changes that Went into Effect December 1, 2012:

- **Compliance Assistance and Assurance Measures:** In states that require notification of fumigant applications, applicators must notify State and Tribal Lead Agencies for pesticide enforcement about fumigant applications they plan to conduct. In California, applicators are not required to notify DPR. Under California's restricted materials requirements, applicators must notify the agricultural commissioner of the county in which the application occurs.
- **Site-Specific Fumigant Management Plans:** All label requirements must be addressed in the FMP.
- **Soil Fumigant Training for Certified Applicators:** New labels require certified applicators to successfully complete a U.S. EPA- approved training program. U.S. EPA-approved soil fumigant training programs are found at **http://www.epa.gov/opp00001/reregistration/soil_fumigants/**. In California, commercial applicators who meet state certification and licensing requirements in Sub-Category O meet the label requirement for applicator training and renewal. Private applicators must successfully complete a registrant-developed training program every 36 months. Additional training enhances the certified applicator's knowledge of fumigant requirements.
- **Community Outreach and Education Programs:** U.S. EPA is requiring fumigant registrants to develop and implement outreach programs to ensure that information about fumigants is available within communities where soil fumigation occurs. Outreach programs will address the risk of bystander exposure, buffer zones, how to recognize early signs of fumigant exposure, and how to respond appropriately in case of an incident. These programs are still under development.
- **Information for First Responders:** Fumigant registrants are required to develop information for first responders in high fumigant use areas to help them recognize incidents related to soil fumigant exposure, how to recognize early signs and symptoms of exposure, and how to treat persons who have been exposed. This information was sent directly to a designated emergency response person in each state. In California, this information was sent to the State Fire Marshal's Office http://osfm.fire.ca.gov/training/pdf/US%20EPA/EmergencyResponderCoverNote.pdf.
- **Buffer zones:** New labels require fumigant users to establish a buffer zone around treated fields to reduce risks from acute inhalation exposure to bystanders. The buffer zone extends outward from the edge of the fumigated area (application block) equally in all directions. All non-handlers, including field workers, residents, pedestrians, and other bystanders, must be excluded from the buffer zone during the buffer zone period except for transit. The buffer zone period begins at the start of the application and lasts for a minimum of 48 hours after the application is complete. Buffer zone distances are included as tables on product

labels. Buffer zone distances vary depending on application rate, number of acres fumigated, and the fumigation method. Labels also specify "credits" that reduce buffer distances, in order to encourage users to employ practices that reduce emissions, such as high-barrier tarps or post-application water seals. Some credits are available for site conditions that may reduce emissions (e.g., high organic or clay content of soils). Credits can be added, but cannot total more than an 80% reduction. The minimum buffer zone distance is 25 feet, and the maximum distance is 2,640 feet (1/2 mile).

- **Posting requirements:** New labels require buffer zones to be posted at usual points of entry and along likely routes of approach to the buffer unless a physical barrier prevents access to the buffer. The signs must include a "do not walk" symbol, fumigant product name, and contact information for the certified applicator in charge of the fumigation. Posting of buffer zones notifies workers to stay out of a hazardous area.
- **Emergency Preparedness and Response Requirements**: To reduce risks to people who live or work near a fumigated field, fumigant labels require the certified applicator to perform emergency preparedness and response measures. These measures are required when the buffer zone is greater than 25 feet, and residents or businesses are within certain distances from the outer edge of the buffer zone:

If the buffer zone is:	AND there are residences or businesses within:
>25 feet but ≤100 feet	50 feet from the edge of the buffer zone
>100 feet but ≤200 feet	100 feet from the edge of the buffer zone
>200 feet but ≤300 feet	200 feet from the edge of the buffer zone
>300 feet	300 feet from the edge of the buffer zone or the buffer zones overlap

When one of the conditions listed above are met, the certified applicator can choose to **either** conduct fumigant site monitoring, or to provide information for neighbors. Requirements of each option are included on the labels, and are summarized below:

Response information for neighbors – If the certified applicator chooses to provide response information, the label requires that he must ensure that the required information be provided to residences and businesses that triggered the response at least 1 week before the application begins. The information may include application dates that are within 4 weeks of the date that the notice is delivered to the residences or businesses. If the application does not occur during the specified timeframe, the information must be delivered again. The information can be delivered as a mailing, door hanger, or other methods that will inform the residences and businesses. The provided information must include:

- Location of the application block
- Fumigant(s) applied, including the active ingredient, name of the fumigant product(s), and the EPA registration number
- Contact information for the applicator and property owner
- Time period when the application is planned to take place
- Early signs and symptoms of exposure to the fumigant(s) applied, what to do, and who to call if they believe they are being exposed (911 in most cases)
- How to find additional information about fumigants.

Fumigant site monitoring – If the certified applicator chooses to conduct fumigant site monitoring, he or the handler(s) under his supervision is required to:

- Monitor for sensory irritation in areas between the buffer zone outer perimeter and residences and businesses that trigger this requirement; and
- Monitor for sensory irritation, beginning the evening on the day of application and continuing until the buffer zone period expires. The monitoring must be done a minimum of 8 times during the buffer zone period, including:
    - 1 hour before sunset
    - During the night
    - 1 hour after sunrise, and
    - During daylight hours.

If the handler conducting the monitoring experiences sensory irritation, the emergency response plan must be implemented immediately.

- **Restrictions for difficult to evacuate sites:** Difficult to evacuate sites are listed on labels as pre-K to grade 12 schools, state licensed daycare centers, nursing homes, assisted living facilities, hospitals, in-patient clinics, and prisons. Applications are restricted within specified distances of these sites.
    - No fumigant application with a buffer zone greater than 300 feet is permitted within ¼ mile of difficult to evacuate sites unless the site is not occupied by children from state-licensed day care centers, students (pre-K to grade 12), patients, or prisoners during the application and the 36 hour period following the end of the application.
    - No fumigant application with a buffer zone of 300 feet or less is permitted within 1/8 mile of difficult to evacuate sites unless the site is not occupied by children from state-licensed day care centers, students (pre-K to grade 12), patients, or prisoners during the application and the 36 hour period following the end of the application.
- **Emergency response plan requirements**: The certified applicator must include a written emergency response plan in the FMP that identifies:
    - Evacuation routes
    - Locations of telephones
    - Contact information for first responders and local/state/federal/tribal personnel, and
    - Emergency procedures/responsibilities (e.g. adding water to the field, repairing tarps, fixing equipment, evacuating upwind) if:

- There is an incident
- sensory irritation is experienced outside of the buffer zone
- there are equipment/tarp/seal failures or complaints, or other emergencies.

Department of Pesticide Regulation

Mary-Ann Warmerdam
Director

Arnold Schwarzenegger
Governor

December 31, 2010

Appendix 3

TO: Interested Parties

SUBJECT: RISK MANAGEMENT DIRECTIVE

This letter outlines the Department of Pesticide Regulation's (DPR's) risk management decision related to the development of use restrictions on pesticides containing the active ingredient chloropicrin as it relates to exposures to residents and bystanders. This risk management decision was made after consultation with the Office of Environmental Health Hazard Assessment, the Air Resources Board, and the California Air Pollution Control Officers Association, as required by Food and Agricultural Code section 14023(e). A subsequent risk management directive will be developed to address occupational exposures after completion of the comprehensive risk characterization document (RCD).

Chloropicrin has been used as an agricultural pre-plant soil fumigant for decades, either alone or in combination with other fumigants. DPR placed chloropicrin into reevaluation in 2001 on the basis of air monitoring data received from the Chloropicrin Manufacturers Task Force. The data indicated that air concentrations at some distances from treated greenhouses exceeded the National Institute of Occupational Safety and Health's reference exposure levels of 0.1 parts per million (ppm). In addition to its fumigant pesticidal properties, chloropicrin is also added (about 2 percent by weight) as a warning agent to odorless products that contain methyl bromide and methyl iodide. Chloropicrin is also added as a warning agent to structures just prior to the application of sulfuryl fluoride. Using the information from the reevaluation and other data, DPR completed an RCD for chloropicrin as a toxic air contaminant (TAC) in February 2010. Based on the RCD and the recommendation of the TAC Scientific Review Panel, DPR will designate chloropicrin as a TAC effective January 8, 2011.

In 2006, the U.S. Environmental Protection Agency (U.S. EPA) finalized its risk assessment of chloropicrin. Following that, U.S. EPA published its Reregistration Eligibility Decision (RED) for chloropicrin in July 2008. The RED specified certain required mitigation measures and identified data gaps that chloropicrin registrants must address to be eligible for reregistration. U.S. EPA is currently using a two-year, phased-in approach to ensure the required mitigation measures are incorporated in the labels beginning in 2011. DPR is collaborating with U.S. EPA on this endeavor.

Acute Effects: Methodology and Target Levels

After evaluating information available (including DPR's RCD), U.S. EPA's risk assessment and RED, chloropicrin pesticide use reports, and pesticide illness reports, U.S. EPA-approved labels, and California county permit conditions for counties with high uses of chloropicrin, DPR will develop mitigation measures for agricultural soil fumigation applications that will address the acute effects of chloropicrin for residents and bystanders. Although acute effects of eye irritation are to be expected, reversible, and necessary when used at the levels of a warning agent, protection of residents and bystanders against those effects could be attained.

DPR has determined that the appropriate regulatory target level to restrict acute exposure to chloropicrin is 73 parts per billion (ppb) or 0.073 ppm averaged over an eight-hour period. This level is based on the evaluation of human studies by Cain in 2004, literature review, U.S. EPA's risk assessment, and DPR's RCD. Based on the human study by Cain, acute effects of eye irritation will not be expected at 73 ppb. According to the same study, 20 percent of the individuals reported some eye discomfort at 100 ppb, and 40 percent of the individuals reported increasing discomfort at 150 ppb. Since the level of discomfort was reported subjectively by individual scoring instead of direct clinical observation, it is difficult to ascertain the dose levels at which the individuals experienced those effects. Additionally, a published study by Prentiss in 1973 noted that lacrimation or tearing was observed at 300 ppb, although no data supporting that statement was presented. Therefore, DPR will develop mitigation measures to restrict chloropicrin exposures to a regulatory target level of 73 ppb or 0.073 ppm averaged over an eight-hour period. This target level is also below the National Institute of Occupational Safety and Health's reference exposure level of 100 ppb. Additionally, since no nasal or throat irritation was reported at the 100 ppb up to the 150 ppb level in the study, protection of the eye irritation effect most likely protects against upper respiratory effects. DPR will use analytical modeling tools to develop mitigation measures using an eight-hour exposure. In order to minimize the likelihood of short-term peak concentrations, DPR will consider other information and tools when developing restrictions.

Since mild ocular effects were first experienced at the 100 ppb level in the study, eye irritation is deemed as a more sensitive endpoint than nasal effects. This is the conclusion reached in DPR's RCD. The RCD also notes an endpoint of increased nitric oxide in expired air at a reference concentration of 4.4 ppb. Increased nitric oxide in expired air is a precursor to the nasal effects of chloropicrin. Although this level is much lower than the regulatory target level, it was reached based on statistical calculations instead of considering both the toxicologically sensitive endpoint and statistical considerations.

According to the study, the acute effects of chloropicrin seen at the 100 ppb level are mild and reversible. Those effects are also consistent with the lowest level (level 1) of exposures identified by the acute exposure guidelines developed by the National Research Council for airborne

concentrations of substances. Because of the permeability of chloropicrin's vapors and the accessibility of ocular nerve endings, and eye effects resulting from those exposures, individuals may experience discomfort, irritation, or certain asymptomatic nonsensory effects, but they are also transient and reversible. These effects are consistent with the acute exposure guidelines level 1, although the small number of subjects inherently limits the human study and the group may not adequately represent the most sensitive individuals. However, not even these effects are expected to occur at the regulatory target level.

Seasonal and Chronic Effects
Since the chemical effects of chloropicrin make it very permeable to the mucous membranes, especially the ocular membranes, its ocular effects are much more of a concern in mitigation development than its nasal effects. According to DPR's RCD, submitted studies, reviewed literature, and other studies, eye irritation is the most sensitive endpoint for chloropicrin. This was also evident in the human exposure studies by Cain. Therefore, in developing mitigation measures, we believe that addressing the ocular effects during acute exposures will address the seasonal and chronic effects from inhalation exposures to chloropicrin.

Lifetime Exposure Effects
Carcinogenicity was discussed in DPR's RCD as one of the possible outcomes for lifetime exposures to chloropicrin. DPR scientists concluded this endpoint based on a weight-of-evidence approach using animal data that showed some tumor formation only in female mice and inconsistent in-vitro and in-vivo genotoxicity tests. From that determination, cancer potency factors were calculated from statistical tests based on a small set of animal data using multiple uncertainty factors to extrapolate to human exposures. Although instinctively conservative and health protective, the confidence in this approach is ambivalent. Additionally, U.S. EPA does not classify chloropicrin as a carcinogen, and a review of data presented by the National Toxicology Program also concludes that the results of the animal studies are inconclusive. After evaluating all available information on the carcinogenic potential of chloropicrin and the differing scientific opinions on this subject, the issue appears to be equivocal at this time.

<u>Conclusion</u>

Since DPR's comprehensive RCD, which includes occupational exposure scenarios, is undergoing internal review and has not been completed, DPR will determine which occupational exposures require risk mitigation through another risk management directive after completion of

the comprehensive RCD. In the meantime, DPR will develop mitigation measures in consultation with the Air Resources Board, the air pollution districts, and the county agricultural commissioners, as required by Food and Agricultural Code section 14024(a) to protect public health concerns for residents and bystanders.

If you have any questions, please contact Dr. Marylou Verder-Carlos, DPR Assistant Director, at 916-445-3984 or mverdercarlos@cdpr.ca.gov.

Sincerely,

Chris Reardon
Chief Deputy Director
916-445-4000

cc: Dr. Marylou Verder-Carlos