Chloropicrin Mitigation Measures

January 16, 2015

Pesticide Registration and Evaluation Committee

Email questions during meeting to:
preccomments@cdpr.ca.gov
Outline

• Background – uses, risks, current requirements
• Development of additional DPR measures
• DPR mitigation measures
  – Buffer zone distances – factors, tables, minimums, credits
  – Emergency preparedness and response
  – Notice of intent
  – Maximum acreage and overlapping buffers
  – Buffer zone duration and tarp cutting interval
  – Tree hole restrictions
  – Fumigation time restrictions
  – Combination products
• Summary and concluding remarks
Background: uses

- Chloropicrin is applied to fields prior to planting for weeds, diseases, nematodes, and insects that are difficult to control.

- Chloropicrin is injected into the soil with a tractor or applied through drip irrigation, and usually covered with a tarp.
Background: product types

- Most chloropicrin is applied using products that also contain methyl bromide (MB) or 1,3-dichloropropene (1,3-D)

<table>
<thead>
<tr>
<th>Product Type</th>
<th>2010-2012 Yearly Average</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pounds</td>
</tr>
<tr>
<td>MB/chloropicrin (e.g., Tri-Con, Terr-O-Gas)</td>
<td>35%</td>
</tr>
<tr>
<td>1,3-D/chloropicrin (e.g., Inline, Pic-Clor)</td>
<td>44%</td>
</tr>
<tr>
<td>Chloropicrin only (e.g., Tri-Clor)</td>
<td>21%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7,488,172 lbs</td>
</tr>
</tbody>
</table>
Background: use trend

- Chloropicrin use has increased due to increased acreage planted and phaseout of methyl bromide that began in 1995
Background: crops treated

- Chloropicrin is primarily used to fumigate soil prior to planting strawberries, nursery crops, raspberries, tomatoes, peppers, and melons

2010-2012 Use (percent of pounds)

- Strawberry 73%
- Soil fumigation 11%
- Raspberry 5%
- Nursery 3%
- Tomato 2%
- Pepper 1%
- Watermelon 1%
- All other crops 4%
Background: locations of applications

• 6 counties account for 89% of pounds used (2010-12)
  – Ventura (30%)
  – Monterey (26%)
  – Santa Barbara (14%)
  – Santa Cruz (7%)
  – Siskiyou (7%)
  – San Luis Obispo (5%)
Background: period of applications

- 75% of chloropicrin is applied during August – October
Background: potential health risks

- As required by federal and state laws, EPA and DPR evaluated potential health hazards
  - Toxicology data evaluated
  - Exposure data (air concentrations) evaluated
  - Eye and respiratory irritation are most sensitive potential toxic effects
  - 33 CA illness episodes were investigated by county agricultural commissioners and DPR during 2001-2011

- EPA revised label requirements in 2011 and 2012 based on its assessment of risks and other factors

- DPR has developed additional mitigation measures based on its assessment of risks and other factors
Background: current use requirements

• **EPA label and other requirements**
  – Phase 1 revisions (Jan 2011): handler protections
  – Phase 2 revisions (Dec 2012): bystander and resident protections

• **DPR regulations**: chloropicrin is a restricted material
  – Applications must be made or supervised by certified applicator
  – A permit must be obtained from county agricultural commissioner

• **County permit conditions**: agricultural commissioners have implemented additional restrictions that vary from county to county

• The most stringent requirements must be followed, whether specified by labels, regulations, or permit conditions
Background: EPA Phase 2 label revisions and other requirements

- Certified applicator training
- Community outreach
- Information for first responders
- Emergency response plan
- Buffer zones and related requirements
Background: label requirements for buffer zones and related restrictions

Buffer zone 25-2640 ft based on method, rate, acres, credits

Emergency preparedness and response – if buffer >25 ft or overlapping, residences and businesses within specified distance require notification or monitoring

DO NOT ENTER/NO ENTRE

FUMIGANT PRODUCT
Fumigant BUFFER ZONE

Buffer posting at usual points of entry

Only fumigation activities and some transit for 48 hrs

Overlapping buffer zones prohibited for 12 hrs

Max block size 120-160 ac

No difficult to evacuate sites within 1/8 or 1/4 mile of fumigation for 36 hrs after fumigation

660 ft for <300 ft buffer
1320 ft for >300 ft buffer
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• Summary and concluding remarks
Development of additional DPR measures

• In Dec 2010 DPR issued a risk management directive to mitigate acute exposure, with a target concentration of no greater than 73 ppb as an 8-hr average for residents and bystanders

• DPR released a mitigation proposal for public comment and peer review in May 2013

• Final mitigation measures include revisions based on comments and corrections to data errors
  - Mitigation measures apply to use as an active ingredient in soil fumigations (products with >2% chloropicrin)
  - Mitigation measures apply to products containing chloropicrin alone, with 1,3-dichloropropene, and with methyl bromide
Development of additional DPR measures: air monitoring

- DPR used monitoring data from 28 chloropicrin field fumigations
  - Air concentrations vary with location, time, fumigation method, application rate, acres, and weather
  - Measured air concentrations are used to estimate emissions (flux)
Development of additional DPR measures: computer modeling

- DPR supplemented monitoring data with computer modeling to estimate air concentrations based on emissions and weather data
  - Emissions from 28 fumigations – change from proposal
  - 5 yrs of historical weather from 5 stations – change from proposal

- Emissions and weather data used for proposal had errors; corrections resulted in smaller buffers

- DPR simulated approximately 250,000 fumigations to estimate distances to 73 ppb regulatory target concentration
Development of additional DPR measures: buffer zones

- Labels only allow fumigation activities and transit in buffer

- DPR buffer zone size is the maximum distance from the fumigated area to the 73 ppb regulatory target concentration

- Several thousand computer simulations show distance ranges from 0 to 4700+ feet

- DPR selected 95th percentile from distribution of buffer distances
  - DPR estimates that air concentrations for 95% of the fumigations will be no more than 73 ppb at downwind edge of buffer
  - This is consistent with DPR mitigation for other fumigants
Development of additional DPR measures: example distribution of simulated buffer zones

Distribution of 12,533 simulated buffer distances for:
- Ventura weather (approx 5 years x 365 days/year)
- Polyethylene tarp broadcast method (7 fumigations)
- 350 pounds/acre
- 40 acres

60 ft
50th%

374 ft
90th%

523 ft
95th%
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  – **Buffer zone distances – factors, tables, minimums, credits**
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  – Fumigation time restrictions
  – Combination products
• Summary and concluding remarks
Buffer zone distances: determined from four factors

1. Region: coastal and inland – change from proposal
2. Fumigation method – change from proposal
   - Tarp type
     - TIF (totally impermeable film assigned 60% buffer credit)
     - Non-TIF (standard polyethylene, 20% buffer credit, 40% buffer credit)
     - Untarped
   - Field type
     - Broadcast (fumigation of entire flat field)
     - Strip (fumigation of orchard or vineyard rows)
     - Bed (fumigation of pre-formed beds)
   - Equipment type
     - Tractor shank injection (shallow or deep)
     - Drip application
3. Application rate
4. Acres
Buffer zone distances: regions – change from proposal

- DPR evaluated buffers using weather data from 5 stations in high use areas

- Coastal buffers are based on Piru (Ventura Co) weather; Salinas had smaller buffers

- Inland buffers are based on Manteca (San Joaquin Co)
  - No single location had consistently larger buffers
  - Tule Lake had more calm days, more uncertainty
  - Belridge area had lower use
Buffer zone distances: 12 fumigation methods – change from proposal

1. TIF tarp broadcast injection
2. TIF tarp bed injection
3. TIF tarp strip deep injection
4. TIF tarp drip

5. Non-TIF tarp broadcast injection
6. Non-TIF tarp bed injection
7. Non-TIF tarp strip injection
8. Non-TIF tarp drip

9. Untarped broadcast shallow injection
10. Untarped broadcast deep injection
11. Untarped bed injection
12. Untarped drip
Buffer zone distances: buffer tables

• 18 buffer tables – change from proposal
  – 6 fumigation methods x 2 regions (coast and inland) = 12
  – 6 fumigation methods default to label buffers

• Each table specifies buffer distances that vary with
  – Application rate (broadcast-equivalent for bed, strip, drip)
  – Acres

• Label buffers differ from DPR buffers due to differences
  in computer modeling inputs

• Labels prohibit applications with buffer zones >2640 ft (1/2 mi)
Buffer zone distances: example buffer zones for untarped broadcast deep injection

<table>
<thead>
<tr>
<th>Application Rate</th>
<th>DPR coastal buffers</th>
<th>DPR inland buffers</th>
<th>Label buffers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 ac</td>
<td>10 ac</td>
<td>40 ac</td>
</tr>
<tr>
<td>100 lbs/ac</td>
<td>100 ft</td>
<td>215 ft</td>
<td>702 ft</td>
</tr>
<tr>
<td>200 lbs/ac</td>
<td>488 ft</td>
<td>780 ft</td>
<td>2032 ft</td>
</tr>
<tr>
<td>350 lbs/ac</td>
<td>976 ft</td>
<td>1536 ft</td>
<td>3786 ft</td>
</tr>
</tbody>
</table>

Orange values indicate minimum distance
Purple values indicate >2640 ft not allowed
## Buffer distances: comparison to label buffers

<table>
<thead>
<tr>
<th>Application Method</th>
<th>Coastal Buffers</th>
<th>Inland Buffers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TIF broadcast</td>
<td>DPR same as label</td>
<td>DPR same as label</td>
</tr>
<tr>
<td>2. TIF bed</td>
<td>DPR same as label</td>
<td>DPR same as label</td>
</tr>
<tr>
<td>3. TIF strip deep</td>
<td>DPR same as label</td>
<td>DPR same as label</td>
</tr>
<tr>
<td>4. TIF drip</td>
<td>DPR same as label</td>
<td>DPR same as label</td>
</tr>
<tr>
<td>5. Non-TIF broadcast</td>
<td>DPR same as label</td>
<td>DPR same as label</td>
</tr>
<tr>
<td>6. Non-TIF bed</td>
<td>DPR 4x – 8x larger</td>
<td>DPR 3x – 6x larger</td>
</tr>
<tr>
<td>7. Non-TIF strip</td>
<td>DPR 2.5x – 3.5x larger</td>
<td>DPR 2x – 3x larger</td>
</tr>
<tr>
<td>8. Non-TIF drip</td>
<td>DPR 1x – 2.5x larger</td>
<td>DPR 1x – 2x larger</td>
</tr>
<tr>
<td>9. Untarped shallow</td>
<td>DPR 1.5x – 2x larger</td>
<td>DPR 1.1x – 1.5x larger</td>
</tr>
<tr>
<td>10. Untarped deep</td>
<td>DPR 1.5x – 2x larger</td>
<td>DPR 1.1x – 1.5x larger</td>
</tr>
<tr>
<td>11. Untarped bed</td>
<td>DPR 2x – 4x larger</td>
<td>DPR 2x – 3x larger</td>
</tr>
<tr>
<td>12. Untarped drip</td>
<td>DPR same as label</td>
<td>DPR same as label</td>
</tr>
</tbody>
</table>
Buffer zone distances: minimum buffer

- DPR and EPA modeling shows concentrations <73 ppb at field edge in some cases, but uncertainty in the modeling

- Minimum buffer zones – change from proposal
  - Labels: 25 ft
  - DPR TIF: 25 ft
  - DPR Non-TIF ≤6 ac: 60 ft
  - DPR Non-TIF >6 ac: 100 ft
  - DPR Untarped: 100 ft
Buffer zone distances: reduction credits

• Labels reduce buffer distances up to 80% using 11 possible “credits” for conditions and practices with lower emissions

• DPR only allows 1 credit: 60% credit for TIF tarps

• Tarps assigned 60% credit require EPA and DPR approval – change from proposal

• Additional DPR evaluation of other credits is in progress

<table>
<thead>
<tr>
<th>Condition or Practice</th>
<th>Label % Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low perm tarp</td>
<td>20, 40, or 60</td>
</tr>
<tr>
<td>Soil OC 1-3%</td>
<td>10, 20, or 30</td>
</tr>
<tr>
<td>Clay &gt;27%</td>
<td>10</td>
</tr>
<tr>
<td>Soil temp &lt;50° F</td>
<td>10</td>
</tr>
<tr>
<td>Symmetry</td>
<td>10</td>
</tr>
<tr>
<td>Thiosulfate</td>
<td>15</td>
</tr>
<tr>
<td>Water seal</td>
<td>15</td>
</tr>
</tbody>
</table>
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• Summary and concluding remarks
Emergency preparedness and response: triggers

- Labels: measures are not required if buffer zone is 25 feet

- Labels: certified applicator must provide response information for neighbors OR conduct sensory monitoring if:

<table>
<thead>
<tr>
<th>Buffer zone is:</th>
<th>AND there are residences or businesses within:</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;25 ft but ≤100 ft</td>
<td>50 ft from edge of buffer zone</td>
</tr>
<tr>
<td>&gt;100 ft but ≤200 ft</td>
<td>100 ft from edge of buffer zone</td>
</tr>
<tr>
<td>&gt;200 ft but ≤300 ft</td>
<td>200 ft from edge of buffer zone</td>
</tr>
<tr>
<td>&gt;300 ft or overlapping buffers</td>
<td>300 ft from edge of buffer zone</td>
</tr>
</tbody>
</table>
Emergency preparedness and response: response information for neighbors

- For this option, labels require certified applicator to provide
  - Location of fumigation (application block)
  - Fumigant product applied
  - Contact information for certified applicator and property owner
  - Time period application is planned (1-4 weeks prior to application)
  - Early signs and symptoms, what to do if exposed
  - How to find additional information about fumigants
  - Persons must be notified again if application doesn’t occur during specified time period

- Additional DPR measure: response information must be provided in English and Spanish
Emergency preparedness and response: sensory monitoring

• For this option, labels require certified applicator or handler to
  – Monitor at least 8 times while buffer is in effect (48 hrs), including
    • 1 hr before sunset
    • During the night
    • 1 hr before sunrise
    • During daylight hours
  – Implement emergency response plan if sensory irritation occurs

• More restrictive DPR measures
  – Monitor at edge of buffer zone
  – Monitor at least two locations in direction of residences, businesses, and downwind; monitor all sides of buffer if calm wind
  – Person monitoring must have full olfactory capabilities
Emergency preparedness and response: notification OR monitoring

Label

DPR mitigation

notification in English

notification in English & Spanish

monitoring area

monitoring site

buffer fumigation

emergency preparedness & response trigger

50-300 ft

DPR mitigation

fumigation monitoring site

50-300 ft
Emergency response plan

• Labels: plan must include
  – Evacuation routes
  – Contact information
  – Phone locations
  – Procedures/responsibilities

• Additional DPR measure: ag commissioner must be notified immediately – change from proposal
Notice of intent (NOI) submitted to agricultural commissioner

- Current regulations require NOI to be submitted at least 24 hrs prior to application

- Additional requirements for chloropicrin
  - Submit NOI at least 48 hrs prior to application, and specify start time
  - Application starts within 12 hrs of specified time, or resubmit
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Maximum acreage

- Maximum fumigated acreage in 24 hrs at one site
  - Label drip: 120 ac
  - Label other methods: 160 ac
  - DPR non-TIF/untarped: 40 ac
  - DPR TIF: 60 ac – change from proposal
Overlapping buffers

- Labels: overlapping buffers are prohibited for 12 hours
- Additional DPR measures
  - Acreage is combined to determine buffer if overlap during first 36 hrs
  - Combined acreage can’t exceed 40 acres
  - TIF acreage excluded – change from proposal
Buffer duration and tarp cutting interval

- Buffer expires 48 hours after application (labels and DPR)
- DPR minimum tarp cutting interval is 9 days from end of application for tarps with any buffer credit; labels require 5 days
Tree hole restrictions

• Labels
  – Buffer zone 25 ft
  – Maximum application rate = 1 lb/hole, 435 lbs/ac

• Additional DPR measures: limits on number of holes and acreage at each site in 24 hrs – change from proposal

<table>
<thead>
<tr>
<th>Maximum Holes/Acre</th>
<th>Maximum Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>100</td>
<td>5</td>
</tr>
<tr>
<td>200</td>
<td>1</td>
</tr>
</tbody>
</table>
Fumigation time restrictions – change from proposal

• Labels have no restrictions on fumigation time

• All other factors being equal, higher air concentrations occur at night due to inversions and more stable atmosphere

• To help avoid peak flux at night for non-TIF and untarped fumigations
  – Applications must start no sooner than 1 hr after sunrise
  – Applications must end no later than 3 hrs before sunset

• TIF fumigations have no time restrictions
Combination products

• 1,3-D/chloropicrin products
  – Buffers are based on chloropicrin
  – 1,3-D products also require 100 ft distance to occupied structure

• Methyl bromide/chloropicrin products – DPR regulations still apply
  – Depending on fumigation method, chloropicrin will usually control buffer distances when present at 33% – 43% or greater
  – More stringent minimum methyl bromide buffers will not change, regardless of mixture
  – TIF tarps are allowed with methyl bromide, but no buffer distance reduction and 40 ac maximum
  – Tree hole fumigations are limited to 1 ac
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## Summary comparison of requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Labels</th>
<th>DPR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max buffer distance</td>
<td>TIF: 290 ft</td>
<td>TIF: label distances</td>
</tr>
<tr>
<td></td>
<td>Non-TIF: 725 ft</td>
<td>Non-TIF: 1x – 8x of label</td>
</tr>
<tr>
<td></td>
<td>Untarped: 1990 ft</td>
<td>Untarped: 1x – 6x of label</td>
</tr>
<tr>
<td>Min buffer distance</td>
<td>25 ft</td>
<td>25–100 ft</td>
</tr>
<tr>
<td>Buffer credits</td>
<td>11 credits</td>
<td>Only DPR-approved 60% TIF tarp</td>
</tr>
<tr>
<td>Emergency prepare &amp; response</td>
<td>Notify in English OR monitor 1 location</td>
<td>Notify in English &amp; Spanish OR monitor 2+ locations; ag comm notified immediately</td>
</tr>
<tr>
<td>Notice of intent</td>
<td>None</td>
<td>48 hrs</td>
</tr>
<tr>
<td>Max acres</td>
<td>120–160 acre block</td>
<td>TIF 60 ac; other methods 40 ac</td>
</tr>
<tr>
<td>Overlapping buffers</td>
<td>Prohibit overlapping buffers for 12 hrs</td>
<td>Non-TIF &amp; untarped buffer based on combined acres during 36 hrs</td>
</tr>
<tr>
<td>Min tarp time</td>
<td>5 days</td>
<td>9 days for 20%, 40%, 60% tarps</td>
</tr>
<tr>
<td>Tree hole limits</td>
<td>None</td>
<td>50–200 holes/ac, 40 ac max</td>
</tr>
<tr>
<td>Fumigation time limits</td>
<td>None</td>
<td>Non-TIF &amp; untarped start 1 hr after sunrise, end 3 hrs before sunset</td>
</tr>
</tbody>
</table>
Concluding remarks

• Next steps
  – Interim permit conditions
  – Regulations or label changes

• The mitigation document, responses to comments, and other information are available on DPR’s website:
  – www.cdpr.ca.gov
  – “LATEST NEWS AND INFORMATION” section