US ENVIRONMENTAL PROTECTION AGENCY

INVESTIGATIVE REPORT

For Title VI Administrative Complaint File No. 16R-99-R9

Office of Civil Rights

8/25/2011

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I. INTRODUCTION

On June 30, 1999, a complaint was filed with the United States Environmental Protection Agency's (EPA or Agency) Office of Civil Rights (OCR) on behalf of children and parents of children attending schools near locations where methyl bromide (MeBr) was applied. The complaint alleged violations of Title VI of the Civil Rights Act of 1964, as amended, 42 U.S.C. § 2000d et seq. (Title VI), and EPA's regulations implementing Title VI, found at 40 C.F.R. Part 7, by the California Department of Pesticide Regulation (CDPR).

OCR accepted this complaint for investigation by letter dated December 11, 2001.

A. Statutory and Regulatory Background

1. Statutory Background

Title VI prohibits discrimination based on race, color, or national origin under any program or activity of a recipient of federal financial assistance.[1] Title VI prohibits intentional discrimination and authorizes federal agencies to adopt implementing regulations that also prohibit discriminatory effects.[2]

Under Section 601 of Title VI,

> No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.[3]

This section prohibits intentional discrimination.[4] In addition, Section 602 "authorize[s] and direct[s]" federal departments and agencies that extend federal financial assistance "to effectuate the provisions of section [601] . . . by issuing rules, regulations, or orders of general applicability."[5] At least forty federal agencies have adopted regulations that prohibit disparate impact discrimination pursuant to this authority.[6] The United States Supreme Court has held that such regulations may validly prohibit practices having a disparate impact on protected groups, even if the actions or practices are not intentionally discriminatory.[7]

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[1] 42 U.S.C. §§ 2000d to 2000d-7.

[2] *See Alexander v. Choate*, 469 U.S. 287, 292-294 (1985); *Guardians Ass'n v. Civil Serv. Comm'n*, 463 U.S. 582, 589-93 (1983).

[3] 42 U.S.C. § 2000d.

[4] *See Alexander*, 469 U.S. at 293; *Guardians*, 463 U.S. at 607-08.

[5] 42 U.S.C. § 2000d-1.

[6] *See Guardians*, 463 U.S. at 619 (Marshall, J. dissenting).

[7] *See Alexander*, 469 U.S. at 292-94; *Guardians*, 463 U.S. at 582; *see also Elston v. Talladega County Bd. of Educ*., 997 F.2d 1394, 1406, *reh'g denied*, 7 F.3d 242 (11th Cir. 1993).

EPA's Title VI implementing regulations are codified at 40 C.F.R. Part 7. Under these regulations, the actions of a recipient of EPA financial assistance may not intentionally discriminate or have a discriminatory effect based on race, color, or national origin. As provided at 40 C.F.R. § 7.120, administrative complaints alleging discriminatory acts in violation of 40 C.F.R. Part 7 may be filed with the Agency. EPA reviews accepted complaints in accordance with 40 C.F.R. Part 7, Subpart E (§§ 7.105-7.135).

2. Regulatory Background - Discriminatory Effects

Under Section 602 of Title VI, EPA promulgated 40 C.F.R. § 7.35(b). This section provides that an EPA funding recipient may not use criteria or methods of administering its programs and activities that have the effect of discriminating against persons based on their race, color, or national origin.[8] In accordance with this provision, recipients are responsible for ensuring that the issuance of their environmental permits does not have discriminatory effects, regardless of whether the recipient selects the site or location of permitted sources.

In determining whether a recipient's procedures or practices have had a disparate impact on a protected group, EPA's OCR must evaluate the causal connection between these facially neutral procedures or practices, and an alleged adverse disparate impact on the protected group.[9] If OCR finds such a connection and finds an adverse disparate impact, the recipient may offer a "substantial legitimate justification" for the challenged practice.[10] If the recipient can make such a showing, the inquiry must shift to whether there are any "equally effective alternative practices" that would result in less racial disproportionality or whether the justification proffered by the recipient is actually a pretext for discrimination.[11] Evidence of either will support a finding of liability.

B. Outcome of Investigation

OCR conducted an extensive investigation and analysis of MeBr use in California from 1995 to 2001. Based upon this analysis, OCR preliminarily found a *prima facie* violation of Title VI as a result of an adverse disparate impact upon Latino schoolchildren.

II. COMPLAINT ALLEGATIONS

On June 30, 1999, a complaint, assigned the EPA reference number 16R-99-R9, was filed with EPA's OCR. The complaint was filed on behalf of children and the parents of children attending schools in California near locations where MeBr was applied. The complainants were: Angelita C., by herself and on behalf of Thalia C. (age 10 – all ages given are as of the time of the lodging of the complaint);

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[8] *See Alexander*, 469 U.S. at 293; *Guardians*, 463 U.S. at 592 (opinion of White, J.); *id.* at 617-24 (Marshall, J., dissenting); *id.* at 642-45 (Stevens, J., joined by Brennan and Blackmun, JJ., dissenting).

[9] *Larry P. v. Riles*, 793 F.2d 969, 982 (9th Cir. 1984); *Elston*, 997 F.2d at 1407 (citing *Georgia State Conf . of Branches of NAACP v. Georgia.*, 775 F.2d 1403, 1417 (11th Cir. 1985)).

[10] *Georgia State Conf.*, 775 F.2d at 1417.

[11] *Id. See generally McDonnell Douglas Corp. v. Green*, 411 U.S. 792 (1973).

Jorge G., by himself and on behalf of David G. (age 14); Margarita M., by herself and on behalf of Aurelio A. (age 11); Emiliano P., by himself and on behalf of Albertina P. (age 11) and Gadiela P. (age 10); Bernabe S., by himself and on behalf of Cesar S. (age 8) and Lucila S. (age 13).

Complainants were represented at the time of the filing of the complaint by Luke W. Cole and Lesley K. Barnhorn, Center for Race Poverty & the Environment; Santos Gomez, Cesar Hernandez and Eileen McCarthy, California Rural Legal Assistance, Inc.; Michael Meuter and Dalila Guzman, California Rural Legal Assistance, Inc.; Anne Katten, California Rural Legal Assistance Foundation; and Shelley Davis, Farmworker Justice Fund, Inc.[12]

The schools attended by the children at the time of the complaint were:

- Rio Plaza Elementary School (located in an unincorporated area near the city of Oxnard, Ventura County),
- Rio Mesa High School (located in an unincorporated area near the city of Oxnard, Ventura County),
- Pajaro Middle School (Pajaro, Monterey County),
- Barton Elementary School (Salinas, Monterey County),
- MacQuiddy Elementary School (Watsonville, Santa Cruz County), and
- Ohlone Elementary School (Pajaro, Monterey County).

The complaint alleged violations by CDPR of Title VI and EPA's regulations implementing Title VI, found at 40 C.F.R. Part 7. The complaint alleged that the CDPR discriminated against school children of color, primarily Latinos, by renewing the registration for MeBr.

The complaint specifically alleged that the CDPR discriminated against Latino children by renewing the registration for MeBr without taking into consideration the health impacts that this pesticide would have on children attending schools that were within a 1.5 mile radius of the areas in which MeBr was applied.[13] The complaint identified the renewal of the MeBr registration by CDPR on January 5, 1999, entitled, "Notice of Proposed Decision to Renew Registration of Pesticides," as the most recent action taken by CDPR concerning MeBr as of the time of the complaint.

MeBr has been re-registered every year by CDPR since that time. The most recent registration took place on January 31, 2011, at which time CDPR renewed the certification of MeBr, among other pesticides, for calendar year 2011.[14]

[12] See *Complaint Under Title VI of the Civil Rights Act of 1964, 42 U.S.C. 2000d and 40 C.F.R. Part 7* (June 30, 1999).

[13] The complaint specifically alleged that CDPR "allows [MeBr] usage at extremely high levels despite methyl bromide's high toxicity, …fails to fully consider the impact on schoolchildren, and … fails to implement readily available less discriminatory and less dangerous alternatives."

[14] See Notice of Final Decision Regarding Renewal of Registration of Pesticide Products for 2011, California Notice 2011-01, dated January 31, 2011 (http://www.cdpr.ca.gov/docs/registration/canot/2011/ca2011-01.pdf)

III. POSITION STATEMENT FROM THE RECIPIENT

As part of the investigatory process, representatives of OCR met with CDPR senior management on September 10, 2002. At that time, CDPR management indicated that it intended to continue with its regulatory process concerning MeBr and that it believed it had taken appropriate measures to date in order to attempt to address the risks posed by MeBr application. CDPR reiterated this position during a conference call held between it and representatives of complainant; this call was hosted by OCR representatives for the purposes of exploring whether the parties wished to discuss potential settlement alternatives. Following OCR's issuance of its April 22, 2011, letter concerning the preliminary finding, CDPR raised questions about the methodology and assumptions underlying the finding of unintentional adverse disparate impact on Latino schoolchildren during the time period examined.

IV. FINDINGS OF FACT

A. Recipient Status

CDPR is a sub-agency of the California Environmental Protection Agency (Cal/EPA). CDPR was established in 1991 by then Governor Pete Wilson as part of a reorganization of the state's several agencies with environmental and public health responsibilities.

CDPR was at the time of the complaint and is currently a recipient of Federal financial assistance from EPA. CDPR has continued to receive federal financial assistance from EPA at least through 2011, as reflected in the EPA Grants Award Database.

B. Methyl Bromide Background

1. Methyl Bromide Uses

Methyl bromide (MeBr, or Bromomethane; CAS 74-83-9) is a broad spectrum pesticide used in the control of pest insects, nematodes, weeds, pathogens, fungi, and rodents. Most of the fumigant is used in fumigating soils prior to planting, with smaller amounts used in post-harvest commodity fumigation, fumigation prior to shipment, and building fumigation.[15]

2. Methyl Bromide Application Practices

When used as a soil fumigant with the "broadcast" pre-planting application method, MeBr gas is usually injected into the soil at a depth of 12 to 24 inches from chisels attached to a moving tractor. This will effectively sterilize the soil, killing the vast majority of soil organisms. Immediately after the MeBr is injected, the soil may be covered with plastic tarps, which slow the movement of MeBr from the soil to the atmosphere. Depending on tarp permeability and retention time, additional MeBr may be emitted to the atmosphere at the end of the fumigation when the tarps are removed. About 50 to 95% of the MeBr injected in to the soil can eventually enter the atmosphere.

[15] See EPA, The Phaseout of Methyl Bromide, Questions and answers about methyl bromide http://www.epa.gov/spdpublc/mbr/qa.html .

3. Methyl Bromide Toxicity and Health Effects

Human exposure to high concentrations of MeBr can result in central nervous system and respiratory system failure, as well as specific and severe deleterious actions on the lungs, eyes, and skin.[16] Chronic exposures have been associated with peripheral neuropathies, especially sensory neuropathy, impaired gait, behavioral changes, and mild liver and kidney dysfunction (at high levels of exposure). Chronic exposure may be more serious for children because of their potential longer latency period.[17]

Highly exposed persons have developed respiratory, gastrointestinal, and neurological problems, including inflammation of nerves and organs, and degeneration of eyes. Fumigation related exposures have resulted in significantly higher incidences of throat and eye irritation, skin injuries, shortness of breath, pain in chest, nausea, fatigue, dizziness, numbness, and weakness of extremities. Exposure to high concentrations has resulted in a number of human deaths. Available toxicity data show effects from MeBr exposures in short-, intermediate- and long-term exposure periods. Other effects noted in animal tests included developmental toxicity (effects on a fetus), neurological effects including lethargy and paralysis, and lesions in the nasal cavity.[18]

Earlier regulatory concern about controlling exposures to MeBr had focused on acute and near-field exposures, or on the chemical's impacts on stratospheric ozone. Since 2001, animal toxicity studies have turned attention to "subchronic" exposure periods of a few days to a few months, as well as to longer-term ("chronic") exposures. These exposure periods (especially the intermediate or subchronic) have been the subject of regulations developed both in California and nationally by EPA's Office of Pesticide Programs (EPA/OPP). For these exposure periods, the most significant health risks involve neurotoxic effects (including dizziness, tremors, convulsions, paralysis, and reduced activity), developmental effects (causing birth defects), and lesions of the nasal cavities.

4. Summary of Federal Methyl Bromide Regulations

MeBr production, use and application methods are regulated at the international, federal and state levels under several sets of laws. At the federal level, these are primarily the Clean Air Act (CAA) and pesticide laws the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 7 U.S.C. §§ 136 et seq., and the Food Quality Protection Act (FQPA). The provisions of these regulations have had, and continue to have, major effects on the production, use and application methods for MeBr. Several federal regulatory provisions have changed conditions of availability and use over the course of this complaint's investigation.

a. CAA

MeBr is regulated under several provisions of the CAA, as a hazardous air pollutant (HAP), as a "volatile organic compound" (VOC) or ground-level ozone precursor, and as a stratospheric ozone-

[16] Ibid.

[17] ATSDR. "Medical Management Guidelines for Methyl Bromide."

[18] See EPA, The Phaseout of Methyl Bromide, Questions and answers about Methyl Bromide http://www.epa.gov/spdpublc/mbr/qa.html. See also http://www.epa.gov/ttn/atw/hlthef/methylbr.html

depleting substances (ODS). Of these, the provisions that have most impacted MeBr use to date have involved ozone depletion.

In 1987, the United States, and many other countries, entered into the Montreal Protocol on Substances that Deplete the Ozone Layer. The CAA was amended to incorporate the provisions of the treaty. Under the requirements of the CAA and the treaty, as subsequently amended, EPA has promulgated regulations to phase out a number of ozone-depleting substances. One of these is MeBr.[19]

For developed countries, the phase-out date for most uses of MeBr was set at 2005. Plans called for production and importation to be reduced from 1991 baseline levels as follows: 25% reduction in 1999, 50% reduction in 2001, 70% reduction in 2003, and 100% reduction in 2005. Production and importation of MeBr after 2005 have been allowed under the provisions for a Critical Use Exemption (CUE). These may be granted by the Parties to the Montreal Protocol to allow those uses that have no technically and economically feasible alternatives. United States' CUE's have been implemented for 2005-2010, and are under development for 2011 and beyond.[20]

Usage rates have been higher than the amounts of production or importation allocated because of the use of chemical stockpiles produced before 2005. EPA's CUE rules allocate specific additional usage amounts from these stockpiles. The current proposed rule for the 2011 CUE was published in the Federal Register on April 28, 2011.[21] In this proposed rule, EPA proposed a list of uses that qualify for the 2011 CUE and also proposed to allocate critical use allowances to producers and importers of MeBr that would allow them to produce and import up to 1,500 metric tons for critical uses in 2011. EPA also proposed to distribute an additional 482 metric tons worth of critical stock allowances to producers, importers, and distributers that would allow the holder to sell MeBr critical use amounts from stocks that were manufactured/imported before January 1, 2005.[22]

Documentation required to support Critical Use Nominations (CUNs) must include information about pest pressure, available substitutes, application rates and application practices. The Parties announced that beginning in 2008 MeBr CUN's were evaluated using standard assumptions regarding the application rate and sealing methods such as virtually impermeable film (VIF) tarpaulins used to cover the soil after application to reduce emissions, except in jurisdictions where use of such films is prohibited (such as California).

Under the CAA, MeBr and several other soil fumigants are also classified as VOCs which contribute to the formation of ground-level (tropospheric) ozone. Many areas of the United States currently do not meet ambient air quality standards for ozone, and are required to develop plans for controlling or reducing VOCs and other pollutants contributing to ozone formation. The California State

[19] See 64 Fed. Reg. 29240 (June 1, 1999) and 65 Fed. Reg. 70795 (November 28, 2000). See also See EPA, The Phaseout of Methyl Bromide, Questions and answers about methyl bromide (http://www.epa.gov/spdpublc/mbr/qa.html).

[20] See http://www.epa.gov/spdpublc/mbr/factsheet2011.html

[21] See 76 Fed. Reg. 23769 (April 28, 2011) at http://www.gpo.gov/fdsys/pkg/FR-2011-04-28/pdf/2011-10345.pdf

[22] See http://www.epa.gov/spdpublc/mbr/factsheet2011.html

Implementation Plan (SIP) includes provisions to decrease VOC emissions in areas of nonattainment, including emissions of fumigants.[23]

b. FIFRA/FQPA

In general, all pesticides sold or distributed in the United States must be registered by EPA, and based on scientific studies EPA must determine that they can be used without posing unreasonable risks to people or the environment. EPA has reviewed MeBr, along with other older pesticides (those initially registered prior to November 1984), under FIFRA to ensure that they meet current scientific and regulatory standards. This process, called reregistration, considered the human health and ecological effects of pesticides and results in actions to reduce risks that are of concern. EPA also has reassessed all tolerances (pesticide residue limits in food) to ensure that they met the safety standard established by FQPA, which amended FIFRA. EPA has integrated reregistration and tolerance reassessment to most effectively accomplish the goals of both programs. EPA completed its assessment of MeBr, and published a Reregistration Eligibility Decision (RED) in 2008, and published an amended final RED in 2009.

MeBr is classified by EPA as a Toxicity Category I pesticide on a scale of I - IV, with I being most acutely toxic for short-term, acute health effects. As a result, MeBr is controlled as a restricted use pesticide, to be used only by trained and certified applicators or persons under their direct supervision. Additionally, personal protective equipment and other use precautions are required.[24]

EPA regulates the use of registered pesticides primarily through the accepted labeling associated with the product. Pesticide labels provide legally binding instructions for the use of the product as well as for the storage of that pesticide. Using a pesticide in a way that is inconsistent with the labeling requirements is a violation of FIFRA. Most pesticide labels (including those on MeBr products) have protective statements covering emergency care; physical, chemical and environmental hazards; spill and leak procedures; storage and handling standards; requirements, any required personal protective equipment; specific use directions including maximum application rates and aeration procedures, and for MeBr, provisions to post warning signs and notify workers and others nearby.. Under federal law, a state cannot amend label language, but may limit uses or add additional restrictions.

EPA has completed its re-registration of MeBr. As part of the process, EPA developed risk assessments for MeBr as part of its public process for making pesticide re-registration eligibility and tolerance reassessment decisions. EPA undertook this effort in order to meet its responsibilities under FIFRA and the Federal Food, Drug, and Cosmetic Act (FFDCA), as amended by FQPA. The

[23] MeBr is also listed under Section 112 of the CAA as a hazardous air pollutant (HAP). Most HAP emissions regulated under the provisions of this section are those resulting from sources at industrial facilities, predominantly those which are defined as "major" sources. Major sources are those which release at least 10 tons per year of a single HAP, or 25 tons per year of combined HAPs.

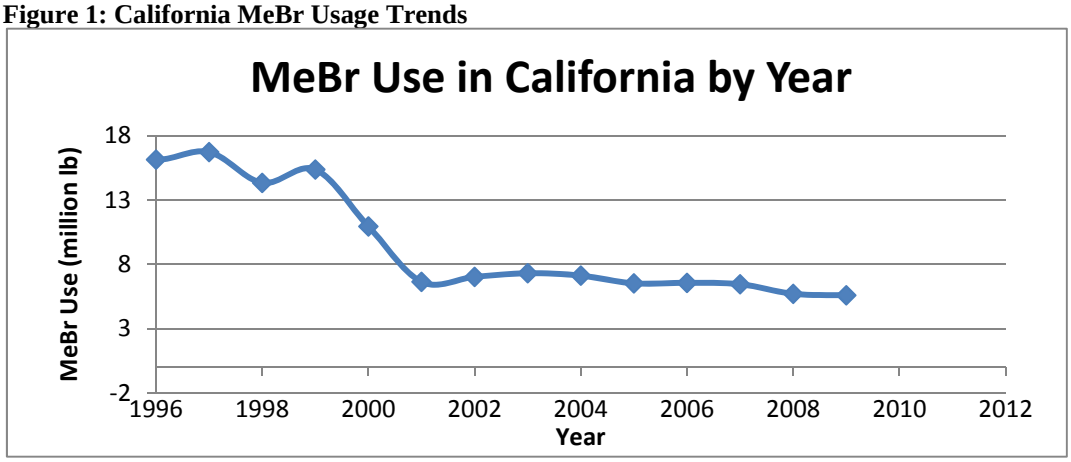
[24] See Testimony of Paul Stolpman, Director, Office of Atmospheric Programs, Office of Air and Radiation, U.S. Environmental Protection Agency, Before the Subcommittee on Forestry, Resource Conservation, and Research of the Committee on Agriculture, U.S. House of Representatives, June 10, 1998 (http://www.epa.gov/ocirpage/hearings/testimony/105_1997_1998/061098.htm).

documents contained in the docket for the EPA rulemaking concerning MeBr re-registration can be found at http://www.regulations.gov (Docket Number EPA-HQ-OPP-2005-0123).

C. Methyl Bromide Use in California

MeBr has been used extensively used in California. Most MeBr in California is used for pre-plant soil fumigation, with about 7% in other uses on post-harvest commodities or for structures. Information compiled by the CDPR has tracked the use of restricted pesticides such as MeBr since 1993. Generally, the use of MeBr has declined gradually since 1991, with a sharper drop occurring between 1999 and 2000, and after a price increase in 2000. MeBr use in California since 2001 continued a similar rate though 2008, through a combination of material carryover from previous years and Critical Use Exemptions.[25] MeBr use (which includes agricultural and reportable non-agricultural applications) in California between 1996 and 2009 was as follows (all amounts are in pounds):

Figure 1: California MeBr Usage Trends



[25] Trout,Tom, USDA-ARS. "Fumigant Use in California – Response to the Phase-Out," Proceedings of the International Conference on Methyl Bromide Alternatives and Emissions Reductions,.(October, 2006).

Table 1: California MeBr Use by Year

Year	MeBr (lb)	Data source	Reduction from Base Year 1999	Reduction from Base Year 2001
1995	17,165,964	5		
1996	16,124,148	4		
1997	16,711,308	3		
1998	14,314,983	2		
1999	15,355,845	2	100%	
2000	10,930,893	1	-28.8%	
2001	6,625,336	1	-56.9%	100%
2002	7,008,644	1	-54.4%	5.8%
2003	7,289,389	1	-52.5%	10.0%
2004	7,105,612	1	-53.7%	7.2%
2005	6,504,576	1	-57.6%	-1.8%
2006	6,541,159	1	-57.4%	-1.3%
2007	6,438,044	1	-58.1%	-2.8%
2008	5,693,325	1	-62.9%	-14.1%
2009	5,575,446	1	-63.7%	-15.8%

Source: Summary of Pesticide Use Report Data

1	2009 (December 2010)
2	2008 (December 2009)
3	2007 (December 2008)
4	2006 (December 2007)
5	2005 (December 2006)

Typical soil application rates in California ranged from about 100 - 200 lb/acre, with about half the agricultural uses in 2002 at greater than 187 lb/acre, and up to 400 lb/acre, depending on application method used. During the analysis period, strawberry growers were the largest users of MeBr in California (about half of the total use). More than 95% of California's strawberry acreage was treated with MeBr between 1997 and 1999.[26] Strawberry fields are typically treated annually (or in some cases every other year) with a fumigant. Most of California's commercial strawberry acreage is concentrated in coastal counties, primarily Monterey, Ventura, Santa Cruz, and Santa Barbara counties,[27] with urban or suburban development nearby.[28]

[26] Carpenter, Janet, Lori Lynch, and Tom Trout, "Township limits on 1,3-D will impact adjustment on methyl bromide phase-out," *California Agriculture*, Volume 55, Number 3 (May-June 2001).

[27] California Strawberry Commission, 2011 Acreage Survey, http://www.calstrawberry.com/fileData/docs/2011_Acreage_Survey.pdf

[28] CDPR, Methyl Bromide Risk Management Plan for Seasonal Community Exposures (June 2001).

Other California crops with large uses of MeBr during the analysis period included other fruits such as grapes (both table and wine), raspberries and cherries, as well as lettuce, tomatoes and peppers. These crops, together with ornamental flowers, and nurseries and greenhouses involved in raising seedlings for planting in fields or containers (and strawberries), used over three quarters of the MeBr in California in 2001.

D. California Pesticide Regulation

Appendix A has a fuller description of CDPR's regulation of MeBr, but this section briefly sets forth pesticide regulation in California generally and a summary of MeBr regulation. Before a pesticide can be used in California, it must be licensed pursuant to California law. This process is in addition to the EPA registration process. CDPR may deny registration to a pesticide which has been approved by the EPA.

The sale and use of MeBr in California are regulated at the federal, state, and local levels through the pesticide label use requirements as registered by EPA and by enforcement authority in the California Food and Agricultural Code (FAC) and the California Code of Regulations, Title 3 (3 CCR). This includes the delegation of authority at the local level to the county agricultural commissioners to control the use of certain pesticides designated as restricted materials through a permitting process.

The Office of Environmental Health Hazard Assessment (OEHHA) is the "risk assessment arm" of Cal/EPA. Prior to the 1991 reorganization, state law required the Department of Health Services and the Department of Food and Agriculture, which had regulated pesticides, to have a shared responsibility for developing pesticide worker safety regulations. The establishment of Cal/EPA created both OEHHA and the CDPR, and both entities continue this shared responsibility.[29]

MeBr is one of the few pesticides for which the California Legislature has directed that regulations be developed. CDPR developed a MeBr risk assessment between 1994 and 1999 to assess exposures to MeBr. The agency proposed an initial regulatory package in 2000, which was approved later that year with an effective date in 2001, and conducted monitoring in high-use areas in 2000 and 2001. A court later ruled that the MeBr 2001 regulations were void because CDPR failed to appropriately consult with the California Department of Food and Agriculture (CDFA). Settlement of separate litigation committed CDPR to consider the regulation of subchronic exposure to MeBr within its re-promulgation of MeBr field fumigation regulations. Ultimately, CDPR issued regulations in 2004 which directed county agricultural commissioners to take steps to ensure that ambient air concentrations of MeBr did not exceed an average exposure of 9 ppb in a calendar month. These 2004 regulations in turn were challenged in court partially on the basis that CDPR had not relied upon the advice provided by OEHHA in reaching its decision. Plaintiffs in this legal challenge were successful and in 2010 CDPR promulgated new regulations, which identified 5 ppb as the revised exposure target, and which also set a monthly usage cap for townships within a calendar month.

[29] See "The History of the California Environmental Protection Agency," http://www.calepa.ca.gov/About/History01/oehha.htm

V. EPA TITLE VI INVESTIGATION ASSESSMENT

A. Assessment Overview

In order to assure that EPA had the necessary information to assess the allegations raised by Complainants, EPA undertook a comprehensive effort to collect data from numerous sources. The Complaint and the attachments thereto contained a significant amount of information regarding the claims being alleged. The complaint referenced a report prepared by a non-governmental organization which analyzed MeBr use near California schools in 1995.[30] In addition, CDPR has published a large amount of information regarding MeBr (and other fumigants) on its website. EPA representatives traveled to California from September 5, 2002 through September 13, 2002 in order to review documents and conduct interviews. Finally, contact and coordination has been maintained with EPA's OPP, which concluded its re-re-registration of MeBr, and published is amended Reregistration Eligibility Document (RED) in 2009.[31]

As with any Title VI determination concerning potentially discriminatory effects, the fundamental questions to be addressed are whether there is an adverse impact recognizable under Title VI which was created by an action of a recipient of Federal financial assistance and, if so, whether that impact is disparate. This investigation first considered the question of adversity and, in order to do so, conducted an exposure assessment. The exposure assessment addresses the question of what populations were being exposed to MeBr, over what period of time, and at what levels.

This process began with a review of existing MeBr usage and ambient air monitoring and modeling data. The analysis of usage data near schools submitted by the complainants had been updated,[32] but did not allow estimation of exposure levels that could be evaluated relative to health benchmarks needed to identify a potential adverse impact. In addition, data collection had been conducted by CDPR, among others. The existing monitoring and modeling data, while substantial, did not address all of the locations, time periods or years which were within the scope of the EPA investigation. Residents and school children may be exposed to volatilization from potentially numerous applications occurring within several miles of a receptor location (school, in this case). Since MeBr continues to volatilize from the soil for days after application, each application site may emit for several days to a week or more after the initial fumigation.

EPA developed a new model to predict aggregate exposure concentrations at public schools potentially impacted by MeBr applications during the years 1995 through 2001. After developing and evaluating a number of alternative model approaches, EPA selected one exposure model to provide predicted concentrations at over 8400 schools. This was used in the exposure assessment, which also relied on

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[30] Environmental Working Group, *Methyl Bromide Use Near California Schools, 1995*. April 1998.

[31] US EPA, Office of Prevention, Pesticides and Toxic Substances. 2009. Amended Reregistration Eligibility Decision for Methyl Bromide (soil and non-food structural uses). EPA 738-R-09-311. May 2009

[32] Environmental Working Group, *An Ill Wind, Methyl Bromide Use Near California Schools, 1998*. February 2000. http://www.ewg.org/files/anillwind_illwind.pdf

data concerning MeBr usage throughout the state, farmland, school information, and weather conditions.

The exposure situations of interest in this assessment involved the aggregate exposure over time to volatilization of MeBr from one or more nearby agricultural applications. The EPA model provided daily concentration estimates, which were averaged to provide concentration estimates for various time periods. The possible exposure averaging time periods of interest include 1 day (or acute), 1-30 days (short-term or subchronic), 30-180 days (intermediate-term or subchronic) and 180 days to a lifetime (long-term, or chronic).

The results from the exposure assessment were compared to multiple target health concentration thresholds established by EPA. For each averaging period of interest, a health benchmark reference concentration was identified. The comparison process included a review of the nature and quality of the data supporting the target thresholds to assist in evaluating the significance of any exposure exceedances. The comparison results, and the associated information concerning the exposure assessment process and target thresholds, were reviewed to evaluate a possible adverse impact under Title VI.

Following an initial determination of adverse impact, EPA reviewed the demographic characteristics of student populations in schools with and without predicted exposure exceedances for those years. The demographic data were used in conducting a disparity assessment which compared the rates of exposure exceedances for Latino and other schoolchildren in the state. The following section describes this process in more detail.

B. Health Benchmarks and Possible Adverse Impacts

1. Health Benchmark Derivation

Comparing exposure levels to one or more target health concentration thresholds is a step determining whether there has been an adverse impact. Once such a comparison is done, one must evaluate the possible significance of any predicted exposure exceeding target benchmarks ("exceedances"). The types of health effects that may be reviewed span a wide range, including developmental toxicity and neurotoxicity. These effects are used to identify health-based concentration thresholds, such as a Reference Concentration (RfC). More information about the process of deriving such target threshold values is presented in Appendix B.

This analysis relies on health benchmark concentrations developed by EPA's OPP as part of its reregistration process for MeBr. In its final 2007 risk assessment, EPA identified target concentrations for residential bystander exposures which included acute, short-, intermediate- and long-term concentrations. The EPA/OPP target levels of 35 ppb are included here for both short-term (2-30 days) and intermediate-term (or "subchronic" for 31-180 days) exposure periods, and of 1.3 ppb for the long-term (or "chronic" for 180 days or more) exposure periods.

EPA's review of the short- and intermediate-term effects of MeBr included several studies of different species. Neurotoxic endpoints were identified as the most critical effect from these studies. For long-term studies, the critical effect was nasal cell lesions.[33]

California agencies have also developed relevant target concentration thresholds, including CDPR and the OEHHA. Three Cal/EPA target levels are evaluated in this assessment for informational purposes, including:

- the 2003 CDPR subchronic target level published in 2003 (9 ppb for children),
- the earlier 2001 CDPR subchronic level of 1 ppb for children (published in 2001),
- the 2010 CDPR revised subchronic level of 5 ppb for children.

The CDPR 2001 level was also supported as the OEHHA subchronic target recommendation, which a state court ruling directed that CDPR should have considered in its 2003 assessment. In 2010, CDPR completed a consultation with OEHHA which identified a revised subchronic target level of 5 ppb over a 30 day period for subchronic exposures.

Table 2: Summary of Inhalation Thresholds of Concern

Exposure Label	Time Period	EPA/IRIS	EPA/OPP (2007)	Cal/EPA-CDPR Children/adults (2003)	Cal/EPA/OEHHA Children/adults (2003)
Acute	1 day	--	300 ppb	210 ppb	--
Short-term ("subchronic")	2-30 days 7 days	--	35 ppb	70 / 120 ppb	--
Intermediate ("subchronic")	30-180 days 42 days (6 wks)	--	35 ppb	9 / 16 ppb	1 / 2 ppb
Long-term ("chronic)	>180 days to Annual or longer	1.3 ppb (1992)	1.3 ppb	1 / 2 ppb	

2. Comparing Exposures and Health Benchmarks

In reviewing the potential significance of inhalation exposures, a comparison is often made between a predicted exposure and a reference concentration (RfC). Exposures higher than the RfC benchmark have sometimes been used to identify a concern for the occurrence of potential adverse impacts and/or support the adoption of risk reduction measures. Under OCR policy for conducting Title VI investigations, exposures equal to or higher than such target benchmarks may provide the basis for a finding of adverse impact under Title VI.[34]

Pesticide regulation agencies may characterize an exceedance of a reference concentration by noting that the desired margin of exposure (MOE) has not been achieved. The target MOE typically represents the product of the combined uncertainty factors used in calculating the target reference

[33] See Appendix B, and US EPA. Office of Prevention, Pesticides and Toxic Substances. 2007. Methyl Bromide: Phase 5 Health Effects Division (HED) Human Health Risk Assessment For Soil, Greenhouse, and Residential/Structural Uses. PC Code: 053201, DP Barcode: D337288. April 10, 2007.

[34] US EPA, *Draft Revised Investigation Guidance*, 2000.

concentration. For EPA's assessment of the short- and intermediate-term toxic effects of MeBr, the desired MOE is 30, and is 100 for long-term effects.

It is important to note that exposures above an RfC or RfD are not automatically assumed to cause a health effect, but rather interpreted that exposures at or below the level are unlikely to have a health effect. However, as the amount and frequency of exposures exceeding the RfC or RfD increases, the probability that health effects may be observed in a human population also increases.

Additional considerations may be involved in evaluating the significance of predicted exposures above a threshold target level. These include the nature and severity of the potential health effects, the frequency of occurrence of the estimated exceedances, as well as the quality and completeness of the exposure and toxicity data. The estimated numbers of persons potentially affected may also be considered in reaching a decision.[35]

C. Exposure Assessment Process

1. Review of Methyl Bromide Ambient Exposure Monitoring

California state environmental agencies monitor MeBr both for long-term and "seasonal" (approximately two month of peak use) periods. The California Air Resources Board (ARB) conducted seasonal air monitoring for CDPR in 2000 and 2001. In 2000, the sites were located in Monterey (September 11-November 3, 2000), Santa Cruz (September 11-November 3, 2000), and Kern (July 19-September 1, 2000) counties. The conclusion reached by CDPR on these data was that the acute and 1-week exposures to ambient MeBr levels at all sites could be considered acceptable. However, at six sites, then-target concentrations of 1 ppb were exceeded, [36] at La Joya Elementary School (Salinas) (3.79 ppb), Pajaro Middle School (Watsonville) (7.68 ppb), the Ambient monitoring station (Salinas (children exposure only) (1.29 ppb), and Salsipuedes Elementary School (Watsonville) (2.6 ppb) in Monterey/Santa Cruz Counties; and Cotton Research Station (Shafter) (2.16 ppb) in Kern County.[37]

In the Fall of 2001, CDPR requested additional seasonal monitoring for ambient concentrations of MeBr. Monitoring was conducted by ARB in Monterey and Santa Cruz Counties between September-November 2001,[38] and in Ventura and Santa Barbara Counties by the Alliance of the MeBr Industry between August-October 2001.[39] ARB conducted additional monitoring in Kern County between July-August 2001.[40] The ARB monitoring for Monterey and Santa Cruz Counties resulted in five of the six monitoring stations exceeding the seasonal average 1 ppb reference concentration. From July through

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[35] US EPA. *Draft Revised Investigation Guidance*, 2000.

[36] The determination found that the margins of exposure (MOEs) for subchronic exposures were less than 100.

[37] http://www.cdpr.ca.gov/docs/dprdocs/methbrom/msum2000.pdf
http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/mebr2000.pdf;
http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/mthdic13.pdf

[38] http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/mbr_13d.pdf;

[39] http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/rpt_0402.pdf;

[40] http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/mbr13dkern.pdf;

October 2002, the Alliance of the Methyl Bromide Industry conducted monitoring at sites in Ventura, Santa Cruz, and Monterey counties. A final report was submitted to the CDPR on April 15, 2003.[41]

In late 2001, CARB added MeBr to its routine monitoring network (i.e., one that monitors for particulate matter, ozone, etc.). Currently, ARB monitors for MeBr every 12 days at eighteen locations throughout the state, primarily in urban locations. Most levels observed at these stations are substantially below those identified in the Monterey, Santa Cruz, and Kern county studies. As a result, they did not provide a clear indication of possible air concentrations in high use areas, and were not routinely collected for the time period of interest in this assessment.

2. Methyl Bromide Exposure Assessment

The exposure averaging periods of interest for this assessment include short-term, intermediate and long-term durations. These may include periods as brief as one day (24 hour average), over a period of one to four weeks (1-30 days), one to six months (21-180 days) and annual or longer averages. The analysis involves developing exposure estimates for multiple averaging periods over a time span of seven years (1995-2001), for a minimum of several thousand receptor sites (*i.e.*, schools). Each receptor site may be influenced by MeBr use occurring within a radius of several miles. Thus, the exposure estimates needed are specific to a particular time and place, across a wide geographic area and time span, in order to link exposures to demographic characteristics needed to perform an analysis of potential disparity in exposures.

Working with a technical support contractor, ICF International, EPA reviewed published literature concerning available exposure models to develop these estimates, and developed a model for this purpose using linear regression techniques. This approach involved using mass of MeBr applications near a receptor, both for the same day and previous days, along with modifying factors to include the influence of geographic proximity, temperature, wind conditions and similar factors. The coefficients for how much weight is given each modifying factor in estimating the concentration based on usage were derived during the model development. This is similar to the approach used by CDPR in predicting concentrations based on nearby MeBr usage that had been proposed for development of application township caps.[42]

While the form of this model is linear, which improves its computational efficiency, the parameters used in the model include ones which are non-linear, such as the inverse of the proximity distance. This is important because several types of physical processes which can be expected to influence concentrations, such as distance, wind speed and direction, are not linear.

EPA elected not to use an existing Gaussian air dispersion model for several reasons, including: 1) these models require input specification of actual emission rates, usually in mass per time per unit area, i.e., they require an estimate of both the fraction of applied MeBr that was volatilized and the temporal

[41] http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/ambi03.pdf

[42] See Li, L., Johnson, B., Segawa, R. (2005).“Empirical Relationship between Use, Area, and Ambient Air Concentration of Methyl Bromide.” *J. Environ. Qual.* 34:420–428 (2005).

profile, and 2) the models require significantly more computational run times than a linear model. Estimating the emission rates by model calibration would be extremely challenging, since each receptor concentration is influenced by volatilization from multiple fumigant application sites at various proximities and directions from the receptor; and which occur on both the current day and several prior days. This assessment is also needed for a large number of widely dispersed sources and receptors, which were estimated to require a significantly longer run time if a conventional model had been used.

EPA also examined other air modeling approaches, such as weights based on raising the modifying factors to a power instead of multiplying by a coefficient. This type of model formulation can only be applied to situations with a single emission source. For this assessment, we have multiple sources impacting each receptor site, where each source is characterized as a combination of usage location and application date. Even transforming the power equation to a linear form using logarithms would not allow use of such an approach.[43]

More information about the model development process is presented Appendix B and in the ICF, 2011a report. More information about the model development process peer review and response to comments received is presented in the reports by Eastern Research Group, 2005, and in ICF, 2011d. More information about the development of data used as input to the model and the exposure and disparity assessment processes is presented in ICF, 2011c.

D. Exposure Assessment Results and Adversity Analysis

1. Exposure Scenarios

Exposure scenarios examined in this assessment include a range of time periods, covering short-term/ intermediate-term (subchronic or seasonal), and long term (chronic) categories. These periods were examined together with corresponding toxicity target thresholds based reviews conducted by EPA/OPP and Cal/EPA.

The results of this analysis showed indications of exceedances of most target thresholds examined. No exceedances of the EPA 35 ppb intermediate-term (30 – 180 days) target level were identified, but there were a limited number of predicted exceedances for the short-term target level, which was also 35 ppb for a 2-30 day period.

For a chronic exposure, while the literal definition of an exceedance is whether the concentration average over a period of six months to a year or more exceeds a target concentration, interpretation often may involve other considerations. There are some situations which may result in long-term averages which exceed a chronic threshold, but which may not be considered an actual chronic exposure. For example, if an exposure "spikes" intermittently, the long-term average might be above a chronic threshold, but if the intervening periods of no or low exposure between spikes are long enough, body metabolism may remove the chemical and avoid the chronic health impacts. As described below,

[43] See ICF, 2011a.

OCR's investigation found evidence that the predicted exceedances were likely actual chronic exposures.

Several factors may affect how chronic exposures at the same average level could cause different impacts. These exposure characteristics include:
Repeated– repeated exceedances are predicted to occur, especially two years in a row
Frequent– exceedances occur in the same year for shorter term averages
Elevated– exceedances are in excess of the threshold, e.g., over 2x as high
Several of the chronic exposure scenarios were identified to consider these factors in the assessment.[44]

The number of schools with estimated exceedances by exposure scenario is presented in Table 1 for each of the examined exposure scenarios. The exposure scenarios included several analyzed using target thresholds identified by California agencies, presented for informational purposes. However, the California state thresholds were not considered in a decision as to whether or not these data provided sufficient evidence to conclude that there had been an adverse impact under Title VI for the period 1995-2001. This section also presents listings of schools with predicted exceedances for some of these scenarios, which similar school-specific listings can be found in either Appendix C of this document, or in supporting documents prepared by an EPA contractor.[45]

[44] ICF, 2011e
[45] ICF, 2011b

Table 3: All Schools – Number of Schools with Exceedances in 1995-2001 by Exposure Scenario*

Criterion	Exceedances	Affected Schools	Benchmark Source & Type
Short & Intermediate term exposures			
> 35 ppb in 7 days	4	3	EPA/OPP, Intermediate (2007)
> 9 ppb in 42 days	102	44	Cal/EPA/CDPR, Intermediate (2003)
> 9 ppb in 30 days	214	69	Cal/EPA/CDPR (2003)
> 5 ppb in 30 days	868	145	Cal/EPA/CDPR, Intermediate (2010)
> 1 ppb in 42 days	5039	743	Cal/EPA/OEHHA, Intermediate (2001)
> 1 ppb in 30 days	7101	929	Cal/EPA/OEHHA, Intermediate (2001)
Long term exposures			
> 1.3 ppb in 182 days	866	168	EPA/OPP, Long-term(2007)
> 1.3 ppb in 365 days	287	91	EPA/OPP, Long-term (2007)
> 1.3 ppb 2x in 182 days in same year	162	64	EPA/OPP, Long-term (2007)
>1.3 ppb in 30 days (6 times in the same year)	29	23	EPA/OPP, Long-term (2007)
> 2.6 ppb and > 1.3 ppb in 182 days in same year for 2 yrs in a row	33*	21	EPA/OPP, Long-term and EPA/OPP x 2, Long-term (2007)
> 2.6 ppb 2x in 182 days in same year	12	9	EPA/OPP x 2, Long-term (2007)

* Bold text indicates scenarios for EPA benchmarks used in the complaint investigation.

Table 4: Predicted Populations with Exceedances by Exposure Scenario, 1995-2001

EPA Exposure Scenario	#Schools	Latino Population	Non-Latino Population	Total Population
> 35 ppb in 7 days	3	3,396	1,567	4,963
> 1.3 ppb in 182 days	168	166,315	78,963	245,277
> 1.3 ppb in 365 days	91	91,199	35,598	126,797
> 1.3 ppb 2x in 182 days in same year	64	63,858	23,560	87,418
> 1.3 ppb 6x in 30 days in same year	23	16,890	7,751	24,641
> 2.6 ppb and > 1.3 ppb in 182 days in same year for 2 yrs in a row	21	13,794	4,998	18,792
> 2.6 ppb 2x in 182 days in same year	9	8,467	3,953	12,420

*School populations are estimated based on either school year enrollments, or averages of multiple years, if the exposure period is outside a single enrollment year (e.g., summer).

Table 5: Number of Predicted Exceedances from 1995 to 2001, by Year and Exposure Scenario

	Number of exceedances of						
	35 ppb in 7 days	1.3 ppb in 182 days	1.3 ppb in 365 days	1.3 ppb in 182 days 2 times in same year	1.3 ppb in 30 days 6x in same year	2.6 ppb and 1.3 ppb in 182 days in same year 2 yrs in a row*	2.6 ppb in 182 days 2x in same year
1995	0	96	24	19	3	3	0
1996	0	107	33	20	1	5	1
1997	0	111	35	13	1	2	0
1998	0	135	35	24	0	3	1
1999	1	173	64	49	7	18	3
2000	2	143	50	34	16	2	7
2001	1	101	46	3	1	NA	0
TOTAL	4	866	287	162	29	33	12

As previously mentioned, several long-term exposure scenarios were evaluated. EPA/OPP's target threshold for MeBr long-term (180 days to lifetime) exposures was identified as 1.3 ppb. As previously mentioned, this includes a total combination of uncertainty factors of 100x. Two scenarios were examined to identify schools with predicted exceedances that met a broad interpretation of this scenario, of exceedances greater than 1.3 ppb over 182 days (about half a year), and of exceedances of the threshold over 365 days (a year).

Several other scenarios were examined to reduce the potential for identifying predicted exceedances that did not actually represent chronic exposures. These involved examining exceedances of twice the threshold target (2.6 ppb instead of 1.3), of exceedances that repeatedly occurred for these periods at the same school for more than one year in a row, and of exceedances that occurred repeatedly for a shorter period within the 180 day time period. The latter involved identifying 30 day averages of the 1.3 ppb chronic target threshold that occurred at least six times in the same year. This confirms that these levels could not have resulted from one or two high-concentration months combined with a number of other months with much lower concentrations.

Ultimately, OCR's determination of whether an adverse impact occurred relies primarily on the short-term (subchronic, 35ppb in 7 days) and base long-term (chronic, 1.3 ppb in 182 days) exposure scenarios. As discussed above, the other permutations of the chronic scenario were evaluated primarily to confirm that actual chronic exposures likely occurred. These other chronic scenarios also include exposures which occurred repeatedly, for longer periods, and sometimes at higher exposure levels than the base case.

Table 6: Summary of Exposure Assessment for Schools Named in the Title VI Complaint

Criterion	Number of Exceedances by School Between 1995-2001					
	Rio Mesa HS	Rio Plaza ES	MacQuiddy ES	Pajaro MS	Ohlone ES	Barton ES
County	Ventura	Ventura	Santa Cruz	Monterey	Monterey	Monterey
Proportion of Students who were Latino (1995-2001)	64%	88%	91%	94%	96%	98%
> 35 ppb in 7 days (# in 7 years)	2	0	0	0	0	0
> 1.3 ppb in 182 days (# in 7 years)	12	10	11	13	13	3
> 1.3 ppb in 365 days (# of years)	6	6	6	6	7	0
> 1.3 ppb in 182 days, 2x in a year (# of years)	5	3	4	6	6	0
> 1.3 ppb in 30 days, 6x in a year (# of years)	1	1	0	1	0	0
> 2.6 ppb and > 1.3 ppb in 182 days in same year for 2 yrs in a row (# of pairs of consecutive years)	4	1	1	3	3	0
> 2.6 ppb in 182 days, 2x in a year (# of years)	4	1	0	0	0	0

Detailed lists of additional schools with predicted exceedances by exposure scenario are available in Appendix C, as well as in ICF, 2011b.

2. Discussion of Exposure Analysis Results

For the schools named in the Title VI complaint, five out of six schools were found to have exceedances in four or more of the seven exposure scenarios based on EPA health targets. The map in Figure 2 depicts four of the six schools named in the complaint (those which are located in Monterey and Santa Cruz counties).

While this assessment process predicted exposures at schools, residences are also located nearby, and at comparable proximities to fields where MeBr is applied. So, these exposures may be expected to occur to school-age populations near these schools, and during times (such as weekends and summer) when school is not in session. (See the map in Figure 2[46])

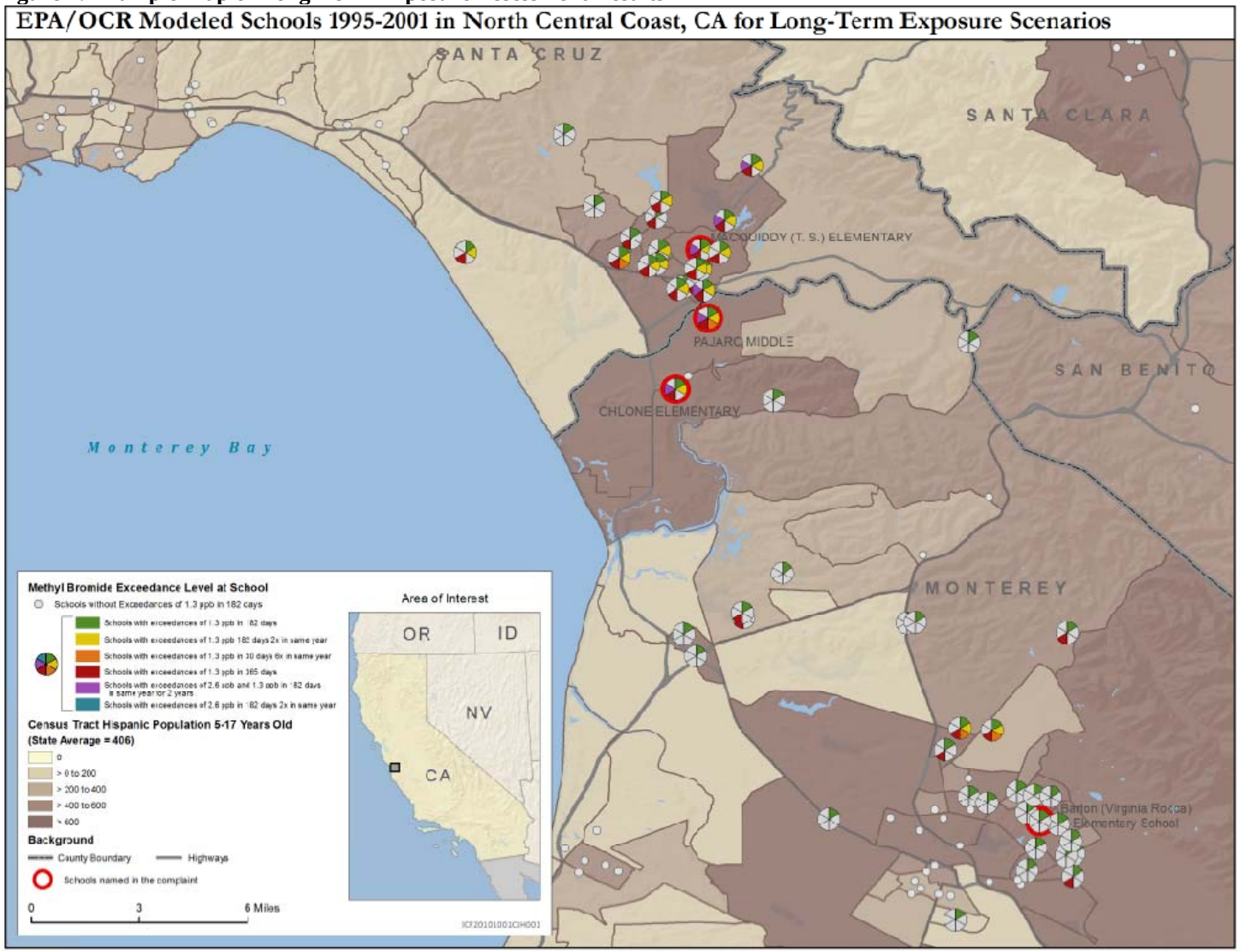
[46] From ICF, 2011b.

Exposures which exceed health benchmarks in 2001 are notable because they occurred after the promulgation of a set of emergency regulations by CDPR which were designed to reduce acute exposures. In 2004 and 2010, CDPR adopted additional use caps for specific geographic areas in a calendar month that were designed to limit subchronic exposures.

Table 7: Number of Schools with Predicted Exceedances and Populations in 2001 only

Criterion	#Schools	Latino Population	Non-Latino Population	Total Population
> 35 ppb in 7 days	1	1,441	903	2,344
> 1.3 ppb in 182 days	98	52,301	23,630	75,931
> 1.3 ppb in 365 days	46	22,029	11,939	33,969
> 1.3 ppb 2x in 182 days, same year	3	3,258	1,783	5,041
> 1.3 ppb 6x in 30 days, same year	1	582	41	623
> 2.6 ppb and > 1.3 ppb in 182 days in same year for 2 yrs in a row	NA	NA	NA	NA
> 2.6 ppb 2x in 182 days in same year	0	0	0	0

Figure 2: Example Map of Long-Term Exposure Assessment Results



Some of the starting dates listed in the detailed tables in Appendix C indicate periods with all or a substantial portion of the exposure period during summer. At these times, the size of the affected population may differ from the regular school year enrollment. However, a number of these schools offer summer sessions. For example, the Oxnard Union High School district, which includes Rio Mesa, Oxnard, Camarillo, and Channel Islands high schools, offered summer sessions between June 27 and August 5, 2006, and the Pleasant Valley School District in Camarillo (also in Ventura county) operated summer sessions between June 26 and July 25, 2006.

Based on data from 2006, several California school districts begin sessions in mid-August. This includes the Pajaro Valley Unified School District, including the MacQuiddy, Pajaro Middle, Ohlone, and Watsonville schools and the Santa Maria School District, including the Adam, Battles, Fesler, Miller and Oakley schools. No specific information was readily available concerning school year starting dates in previous years, but it is reasonable to assume that they would be at similar times.

In Ventura County, the Oxnard Elementary School District, including schools Brekke, Chavez, Lemonwood and Rose Avenue elementary schools, operates fifteen schools on a year-round schedule, with students divided into one of five calendar tracks. Classes begin for one track on August 8, 2006, and ended for another track on July 27, 2006.

Moreover, as noted above, residences are also located nearby the schools, and at comparable proximities to fields where MeBr is applied. So even if the schools were not in session or operating below capacity, any children living close by may have been exposed to similar concentrations as those at the school sites examined.

3. Approach to an Adverse Impact Decision

EPA recognizes that an exceedance of a concentration threshold such as the ones listed in the tables previously have been identified as a significant concern, and expects to generally recognize such exceedances as adverse under Title VI. Similar criteria are widely used to support a basis for action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA) legal authorities. For example, EPA CWA enforcement guidance states:[47]

> An imminent harm or endangerment must only pose a reasonable cause for concern for the public health or welfare in order to constitute an "imminent and substantial endangerment" and warrant the invocation of Section 504 authority. Discussing the meaning of the word "substantial" as found in the "imminent and substantial endangerment" phrase in Section 106 of CERCLA; the court in U.S. v. Conservation Chemical Co., 619 F.Supp. 162, 194 (D.C. MO.1985) illustrates the appropriate determinative factors to be accorded that term: [T]he word "substantial" does not require quantification of the endangerment (e.g., proof that a certain number of persons will be exposed, that "excess deaths" will occur, or that a water supply will be contaminated to a specific degree). Instead, the decisional precedent

[47] EPA, "Guidance on Use of Section 504, the Emergency Powers Provision of the Clean Water Act" 1993.

> demonstrates that an endangerment is substantial if there is reasonable cause for concern that someone or something may be exposed to a risk of harm by a release or a threatened release of a hazardous substance if remedial action is not taken, keeping in mind that protection of the public health, welfare and the environment is of primary importance. A number of factors (e.g., the quantities of hazardous substances involved, the nature and degree of their hazards, or the potential for human or environmental exposure) may be considered in determining whether there is reasonable cause for concern, but in any given case, one or two factors may be so predominant as to be determinative of the issue.

In evaluating the potential adversity of MeBr predicted exposures, air concentration estimates for various exposure periods were compared with health target thresholds for corresponding time periods. Longer exposure periods generally are associated with lower thresholds. The risk represented by an exceedance of a target exposure threshold may or may not result in an observable health impact on exposed persons, and may not affect all (or possibly any) persons exposed above that level. The target concentrations are intended to estimate levels which, if they are not exceeded, would not be expected to have a health effect. Exposures above those levels may not have such an effect, but cannot be presumed not to.

Evaluating the potential for adversity determination under Title VI involves consideration of the completeness and accuracy of exposure estimates, of toxicity data used in identifying target thresholds, the frequency and magnitude of exceedances, and the distribution and size of affected populations.

The process of identifying an exceedance involves comparing predicted exposure levels for a given time averaging period with one or more target thresholds of concern for the same period. In this case, both EPA/OPP and California environmental agencies have developed target estimates of concern which are relevant to evaluating potential adversity.[48] However, for the purpose of this Title VI investigation, OCR relied exclusively on EPA/OPP's target thresholds.

Several chronic exposure scenarios were of interest in this evaluation, in addition to the simple averages of predicted days in the exposure period. A large number of schools (168) were predicted to exceed 1.3 ppb in a 182 day period. As mentioned, this could have resulted from a high but short-lived exposure period which, when averaged over the period, have resulted in an exceedance.

[48] For MeBr, health effects other than the critical effect which was used to set the target level may occur with chronic exposures For example, while the health endpoint used to set chronic levels was nasal lesions in rats, the CDPR risk characterization noted that the chemical's neurotoxic effects are persistent, and that animals that had previously been exposed to a low level of MeBr were more sensitive to subsequent doses than unexposed animals. The risk characterization concluded that, "[The chronic target threshold] may underestimate the risk of repeated yearly exposure as there is evidence of cumulative toxicity, in particular, neurotoxicity." (CDPR. Methyl Bromide RCD Volume I Inhalation Exposure. February 14, 2002) Also, while no long-term inhalation toxicity test results are available for species other than rodents, in shorter duration neurotoxicity studies, rodents were found to be less sensitive than dogs and other species to the neurotoxic effects of MeBr.

To account for this issue, several additional scenarios were examined. For example, a smaller but still substantial number (64 schools) were predicted to exceed this threshold in each of two 182 day periods in the same year. A total of 23 schools were estimated to have exceeded the 1.3 ppb in six 30-day periods in the same year (for a total of 180 days), which indicates that exposures over a period of one to three months did not account for these situations. The selection of six instances was one possible choice; a larger number of schools would be found to exceed this threshold for 4 or 5 30 day periods in the same year as well.

Other exposure scenarios evaluated the potential to further exceed the threshold concentration of concern. Nine schools are predicted to exceed a higher threshold of 2.6 ppb of two 182 day periods in the same year. Finally, 21 schools were predicted to have exceedances of 1.3 ppb and 2.6 ppb during 182 day periods in the same year, for two years in a row. Along with the information on the number of times particular schools have met a scenario exceedance criterion during the study period of 1995-2001, this indicates that a number of schools have been repeatedly experiencing exceedances, which also suggests that actual chronic exposures occurred. Table 6 displays these data for the schools named in the Title VI complaint. Five out of six of the listed schools were predicted to have exceeded target concentrations in multiple exposure scenarios more than once during 1995-2001.

4. Discussion of Adverse Impact

a. Adverse Impact Results for All Schools

Short-term/Subchronic exposure: Several schools with exceedances of EPA/OPP's short-term (2-30 day) exposure period reference concentration (35 ppb) were identified, with an estimated total of 3710 children in 3 schools with predicted exceedances in 3 years.

> ***Conclusion*** The available data support a finding of adverse impact under Title VI for short-term (subchronic) exposure periods.

Chronic exposure: For long-term exposures, exceedances of the EPA target concentration were observed, both using simple average calculations (e.g., all days in a 182 day, six month period, with 168 schools predicted with exceedances) and several more rigorous scenarios. A large number of schools (91) were also predicted to have exceedances for a one year period.

Chronic (multiple scenarios): 127,000 to 245,000 students in multiple years

These targets were also exceeded for an appreciable number of sites for multiple subperiods of the year, such as six 30-day periods (for a total of 180 days at 44 schools), indicating that the longer term averages were not the result of one or two "spikes" in exposure. A number of schools were repeatedly identified as adversely impacted in multiple years. An appreciable number of affected schools and populations (more than 18,000), were identified as exceeding both a higher target threshold (2.6 ppb), as well as the 1.3 ppb threshold in the same year, and for two years in a row.

Conclusion: The available data support a preliminary finding of adverse impact under Title VI for long-term (chronic) exposure periods.

b. Adverse Impact Results for Schools Named in the Complaint

Most of the schools listed in the Title VI complaint are predicted to be impacted in more than one exposure scenario and exposure averaging period, as shown in Table 6. For example, one of the complaint schools was predicted to exceed the EPA 35 ppb target threshold for intermediate-term exposure. Five of the six schools had predicted chronic exposure exceedances, including the 1.3 ppb target in a 365 day period (and for at least six of the seven years studied), and of a higher target-concentration of 2.6 ppb in 182 days/1.3 ppb in 182 days (same year) for two successive years in a row.

Schools with exceedances of both subchronic and chronic exposure targets are potentially impacted from both types of exposures. All three schools which exceeded 35 ppb in 7 days also exceeded chronic thresholds, such as the 1.3 ppb over six 30 day periods in the same year, as well as the 1.3 ppb level over a 365 day period.

c. Other Impact Considerations

As shown in Table 7, the predicted exceedances continued into 2001, after new state regulations to reduce exposure were adopted. In 2001, predicted exceedances were reduced, but not eliminated. For example, one school exceeded 1.3 ppb in six 30 day periods in the same year. Table 11 in Appendix C displays results for the 95 schools (including five schools named in the complaint) with predicted 182 day concentrations above the 1.3 ppb chronic target level in 2001.

While the proportion of all schoolchildren attending schools with predicted exceedances is relatively low, it is not insubstantial. California is a large state, with a public school population of between 5.4 and 6 million students in this time period. The total population in schools with predicted exceedances between 1995 and 2001 varies by exposure scenario. For the short-term exposure scenario (exceedances of 35 ppb in a 7 day period), the number of students at schools with predicted exceedances is less than 5000 students. For two of the chronic exposure scenarios examined to explore repeated and/or elevated exposures above a target threshold, the potentially affected populations were between 12,000 and 19,000. For three chronic exposure scenarios, the potentially affected population of students was more than 87,000, and one was more than 200,000 over the entire period.

E. Disparity Analysis Evaluation

Evaluation of the disparity information relies on two types of criteria, one to assess statistical significance and one to assess policy significance. As described below, a potential disparity is often examined by computing a ratio of demographic characteristics between groups potentially affected and not affected. Such ratios are evaluated for both statistical and policy significance.

1. Disparity Analysis Background

In evaluating disparity in adverse impacts, EPA used techniques derived from methods used in other Title VI cases, as well as from cases under Title VII of the Civil Rights Act involving employment discrimination. As a result, two approaches were adopted in terms of conducting the disparity analysis: the Threshold Risk Ratio and the Demographic Ratio.

These methods involve comparing the composition of the populations which are considered experiencing an adverse impact, which in this case are those exceeding the target threshold concentration for a particular exposure scenario, to a comparison population. In this case the comparison population is the remaining set of California public school students not exceeding the target exposure concentration.

Both disparity ratios were calculated for each calendar year of each exposure scenario, and also evaluated across all years combined. The definition of these ratios can be stated as follows:[49]

> The Threshold Risk Ratio is the ratio of (1) the probability of a Latino public school student in California to be affected to (2) the probability of a non-Latino student to be affected.
>
> The Demographic Ratio is the ratio of (1) the probability of an affected student to be Latino to (2) the probability of a non-affected student to be Latino.

The *comparison population* for the disparity analysis is the population selected for comparison with the affected population, in order to evaluate whether there is a significant difference between them with respect to demographic characteristics or degree of impact. This implies that it is a group of people that could have been equally likely to be affected if the recipient's actions had resulted in alternative location, distribution or magnitude of the facility or activity that is the source of a stressor leading to an impact. (In non-discrimination legal terms, the populations are "similarly situated.") In Title VI assessments, the comparison population is often identified as all or part of the population residing in the jurisdiction of the permitting authority (e.g., an entire state, county, or air or water quality management district).

In interpreting the significance of these ratios, statistical tests are normally performed to assure that the observed differences were very unlikely to have resulted from chance, that is, if the differences could have resulted solely from the variability in the data. Although court precedent does not establish a uniform test of statistical significance, if the differences could arise by chance less than about 1% of the time (usually equivalent to about three standard deviations), the test of statistical

[49] These are comparable to ratio calculations used to evaluate disparate impact under employment discrimination laws, such as Title VII of the Civil Rights Act of 1964. Such ratios are often used to evaluate the proportion of persons of a particular race or ethnicity in a selection category relative to a comparison population. The Threshold Risk Ratio corresponds to a "hypergeometric" analysis, while the Demographic Ratio corresponds to a "binomial" analysis (also known as a "pools analysis") (Biddle, 1995).

significance is usually considered to have been satisfied.[50] However, statistical significance is necessary for a finding of disparate impact, but is not sufficient by itself.

Generally speaking, "to make out a prima facie case the statistical disparity must be sufficiently substantial to raise an inference of causation."[51] It is important to remember that in order to determine what might be considered statistically significant or substantial, "courts appear generally to have judged the 'significance' or 'substantiality' of numerical disparities on a case-by-case basis. [Citation omitted in original] At least at this state of the law's development, we believe that such a case-by-case approach properly reflects our recognition that statistics 'come in infinite variety and …their usefulness depends on all of the surrounding facts and circumstances.' "[52]

EPA's Title VI *Draft Revised Investigation Guidance*, indicated that a ratio value which was at least a factor of 2 (i.e., 100% higher) for a demographic subgroup was an indication of substantial disparity. Other examples of policy significance can be inferred from a review of Title VI and Title VII case law. Generally, courts have occasionally supported differentials of 20% or more, often supported differentials of at least 50%, and almost always supported differentials of 100% (2x) or more.

2. Estimating the Potentially Affected Populations

The EPA analysis linked the predicted exposures at each school with the student population demographics for that period. Student data was available by school year, but all other relevant data (*e.g.*, MeBr usage) was available by calendar year. EPA used a weighted average of the school year populations to create calendar year populations, which were then analyzed with the other calendar year data. The estimates of potentially affected populations were derived separately for each exposure averaging period based on these data. Total potentially affected populations were estimated across years by accounting for the sets of incoming and outgoing students at each school in a year. This method was used to avoid the double-counting that would result if populations in each year were simply added together, since many students attend the same school for several consecutive years.[53]

3. Comparison Populations

To evaluate the potential disparity in predicted exposures above a target threshold for California schoolchildren, identification of a comparison population was needed. For purposes of comparative analysis it is usually better not to include the population identified as potentially affected as part of the comparison population, so that the two sample groups are statistically

[50] See, Hazelwood School District v. United States, 433 U.S. 299, 311, n.17 (1977), Castaneda v. Partida, 430 U.S. 482, 496-497, n. 17 (1977).

[51] Smith v. Xerox Corp., 196 F.3d 358, 364 (2nd Cir. 1999), citing Watson v. Fort Worth Bank & Trust, 487 U.S. 977, 994-995 (1988), NAACP v. Town of East Haven, 70F.3d 219, 225 (2nd Cir. 1995).

[52] Teamsters v. United States, 431 U.S. 324, 340, 97 S.Ct. 1843, 1856-1857, 52 L.Ed.2d 396 (1977); Watson v. Fort Worth Bank and Trust 487 U.S. 977, 995 n.3 (1988).

[53] ICF, 2011b.

independent, leading to a simpler statistical analysis. For this investigation, a suitable comparison population was the set of school children attending California public schools where the predicted MeBr concentration was predicted to be below a health benchmark (i.e., non-affected school populations). Together, the affected and non-affected subgroups comprise the entire set of students enrolled in California public schools. All these school children could potentially have been affected had the proximate MeBr usage been sufficiently high and the meteorological conditions been favorable to high and/or sustained ambient concentrations.

It might be argued that not all schools are located sufficiently close to MeBr use to be potentially affected by methyl bromide. However, EPA's analysis indicates that farmland in California is so ubiquitous that 84% of California schools could be exposed to potentially significant MeBr concentrations. (See Appendix E of this document, and Appendix C of the ICF, 2011b report). Because the geographic analysis did not address the possibility of concurrent methyl bromide applications on clusters of agricultural parcels, 84% may be an underestimate of the schools. Thus, we believe it is reasonable to assume that virtually all California schools are potentially affected. Moreover, even if non-farm schools (*i.e.*, those located more than 5 miles from farmland of 40 acres or more, including many urban schools) were excluded from the comparison populations, the proportion of Latino students remains about the same or decreases slightly. As a result, the disparity remains about the same or *increases* slightly.

For this analysis, therefore, the comparison population was the set of students enrolled at California public schools that were predicted not to experience an exceedance during the assessment period. This comparison may be either in a particular calendar year for the yearly analyses, or across all affected calendar years for the aggregate analysis.

As described above, the goal of this disparity analysis is to assess two comparisons:

(a) whether there was a substantially greater probability of members in a protected population group (i.e., in this case Latino schoolchildren) being affected than members of non-protected population group (i.e., in this case non-Latino schoolchildren);[54] and

(b) whether members of the protected population group comprise a substantially greater proportion of the affected population than of the non-affected population.

4. Disparity Analysis Results

Results of the disparity analysis are summarized in Table 8, and presented in detail in Table 17, which included results by year. (See Appendix D). The results indicate that, with the exception of a small number of individual years, both ratios consistently were found to be approximately 1.5 or

[54] This is similar to the approach recommended in 1978 EEOC guidelines (EEOC, 1979) for evaluating discrimination in employment practices, and used in a number of discrimination cases involving Title VII of the Civil Rights Act.

higher. For the short-term exposure scenario, the mean of the values across years was 4.08 for the Threshold Risk Ratio, and 1.66 for the Demographic Ratio.

For the chronic exposure scenario of exceedances of 1.3 ppb for 182 days, the mean Threshold Risk Ratio was 3.24. In the definition described above, this indicates that Latino schoolchildren were on average 3.24 times more likely to be in the population group with MeBr exposure exceedances than non-Latino schoolchildren during 1995-2001.

For the same scenario, the mean Demographic Ratio was 1.70. This indicates that in the population group with exceedances, the proportion of Latino schoolchildren was 1.70 times higher than the proportion of Latino schoolchildren in the comparison group during this period. The ratios for this chronic exposure scenario (*i.e.*, 1.3 ppb for 182 days) form the primary basis for OCR's decision making regarding disparity.

Several other long-term exposure scenarios were examined, as described previously, to confirm that exceedances were likely to be consistent with chronic exposures. For all but one of these, the disparity analysis results were similar to that of the scenario just described (above 1.3 ppb over 182 days). The mean values of the both ratios were higher in four out of five of the other chronic exposure scenarios. The range of mean (across years) values of the Threshold Risk Ratio for all chronic exposure scenarios was 2.98 to 5.41.

As shown in Table 8, the Threshold Risk Ratio ranged from 0.96 to 18.17 across all years and exposure scenarios. As the Table 17 listing for each year shows, the 18.17 value applies to the "> 1.3 ppb 6x in 30 days in same year" for 2001 only. This relatively high value might be an outlier because the total number of persons predicted to have an exposure exceedance was relatively small (623) and at only one school that year. The only instances in which the ratios were below 1.0 (indicating that Latino schoolchildren were not more likely to be in the "affected" group) occurred in 1996. The Threshold Risk Ratio value of 0.96 for that year applies to the "> 1.3 ppb 6x in 30 days in same year", and might also be an outlier because the total number of potentially affected was relatively small (518) and only one school was "affected" group

The Demographic Ratio compares the proportion of the estimated "affected" students that are Latino with the proportion of the estimated "non-affected" students that are Latino. Average ratios (across years) for the each of the chronic exposure scenarios ranged from 1.62 to 1.82. These findings suggest that, on average for this period, "affected" students were at least 62% more likely to be Latino than "non-affected" students across all the exposure scenarios examined.

As shown in Table 8, this ratio varied from 0.97 to 2.34 across years and criteria. The 0.97 value also was found to the "> 1.3 ppb 6x in 30 days in same year" for 1996 only, and might be an outlier for the same reasons. This was the only ratio less than 1. Except for that year, the range of values for the Demographic Ratio in other years was 1.47 to 2.34.

In addition to evaluating disparity for each calendar year from 1995 – 2001, the disparity ratios over the entire aggregate 1995-2001 time period are also estimated with two different approaches. The

first is to estimate the multi-year ratios by simply averaging the corresponding ratio values over the seven individual years (*i.e.*, the mean value). For the second approach, student grade cohorts are estimated from year to year within each school over the 7-year period, so that students who experience predicted exceedances in more than one year at the same school are counted only once. That is, this approach estimates the number of unique students who are potentially affected one or more times, and the number of unique students who are not potentially affected.

The tests of statistical significance performed show that, other than the single case with a small affected population, the ratios are statistically significantly different from 1, which would be the ratio if there were no estimated disparity. The p-values were all less than 10^{-66}, which corresponds to approximately 17 standard deviations, i.e., much greater than the 2-3 standard deviations which has often been identified as a threshold value for utilizing analysis results to support a finding of disparity. These data are presented in spreadsheets attached to the EPA contractor's report on the exposure and disparity assessment.[55]

Table 8: Summary of Disparity Analyses

		Population Affected			Threshold Risk Ratio		Demographic Ratio	
Exposure Scenario	Years	Total across years	Yearly Range	Mean	Yearly Range	Mean	Yearly Range	Mean
> 35 ppb in 7 days	1999-2001	4,963	1,235 – 2,482	2,020	2.05 – 7.52	4.08	1.40 - 1.99	1.66
> 1.3 ppb in 182 days	1995-2001	245,277	63,130 - 97,819	80,661	2.84 – 4.11	3.24	1.59 - 1.88	1.70
> 1.3 ppb in 365 days	1995-2001	126,797	18,813 - 56,446	35,443	2.37 – 6.87	4.03	1.49 - 2.11	1.78
> 1.3 ppb 2x in 182 days in same year	1995-2001	87,418	5,041 – 45,735	20,977	2.35 – 7.08	4.21	1.48 - 2.12	1.79
> 1.3 ppb 6x in 30 days in same year	1995-1997, 1999-2001	24,641	518 - 13,229	4,705	0.96 – 18.17	5.30	0.97 - 2.13	1.62
> 2.6 ppb and > 1.3 ppb in 182 days in same year for 2 yrs in a row	1995-2000	18,792	1,253 – 13,035	4,314	2.51 – 14.74	5.41	1.56 - 2.34	1.82
> 2.6 ppb 2x in 182 days in same year	1996,1998, 1999, 2000	12,420	2,316 – 6,412	4,312	2.20 – 3.99	2.98	1.47 - 1.75	1.63

5. Disparity Analysis Finding

This analysis included evaluations of the statistical significance of the calculated disparity ratios. As previously mentioned, statistical significance is not necessarily same as policy significance, but is generally a minimum requirement for consideration of disparity values in disparate impact cases.

[55] ICF, 2011b.

Statistical significance testing is designed to determine the probability that chance as the basis of a calculated difference, and if help identify whether this value is low enough that chance alone would have been the cause. With large affected populations, (e.g., thousands), statistically significant differences in composition may be found, even if the differences are small in magnitude.

Policy evaluations may depend partially on Title VI case precedents. For example, a disparity ratio value which was at least a factor of 2 was suggested as an example of substantial disparity in the *Draft Revised Investigation Guidance.*[56] In this analysis, two sets of disparity ratio values were computed, with one (the Threshold Risk Ratio) generally larger than the other. As previous noted, EPA's determinations about adversity focus on the short-term (subchronic) scenario (*i.e.*, 35 ppb in 7 days) and the baseline chronic target threshold (*i.e.*, 1.3 ppb in 182 days). The disparity analysis results for these two exposure scenarios show Threshold Risk Ratio mean (across years) values from 3.24 to 4.08, and Demographic Ratio mean values from 1.66 to 1.70, with no values below 1.5 in any year. These values indicate a substantial disparity for all years for these two scenarios. Moreover, the mean values for the additional exposure scenarios had ranged from 2.98 to 5.41, and the Demographic Ratios mean values ranged from 1.62 to 1.82. Although one year included ratio values below 1, overall these values indicate a substantial disparity for almost all years for these additional scenarios.

VI. ANALYSIS AND DETERMINATIONS

A. Legal Context for the Assessment

1. Evidentiary Burden of Proof

The preponderance-of-the-evidence standard is the applicable burden of proof in this investigation. In other words, to make a finding of adverse disparate impact, the Agency must be satisfied at every step of the analysis that the record demonstrates that it was more likely than not both that an adverse impact from MeBr exposure exists during the study period, and that this impact is disparate between the applicable group (Latino students) and others (non-Latino students).

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[56] Excerpt from the *Draft Revised Investigation Guidance*:

> A finding of an adverse disparate impact is most likely to occur where significant disparity is clearly evident in multiple measures of both risk or [other] measure of adverse impact, and demographic characteristics. . . . . For example, where credible measures of both the demographic disparity and the disparity in rates of impact are at least a factor of 2 times higher in the affected population, OCR would generally expect to find disparate impact under Title VI. Similarly, in instances where the disparity of both demographic characteristics and impacts are relatively slight, a finding of disparate impact is somewhat less likely (e.g., in cases where both the disparity of impact and demographics are not statistically significant). Finally, where a large disparity exists in terms of impact and a relatively slight disparity exists with regard to demographics (or vice versa), EPA will ordinarily attempt to balance these factors, taking into account the particular circumstances of the case. For instance where a large disparity (e.g., a factor of 10 times higher) exists with regard to a significant adverse impact, OCR might find disparate impact even though the demographic disparity is relatively slight (e.g., under 20%).

2. Legal Framework

In assessing whether a recipient's criteria or methods of administration resulted in unlawful discriminatory effects, the Agency relies, in part, on case law developed under Title VI and Title VII of the Civil Rights Act of 1964, 42 U.S.C. § 2000e *et seq.* *See Elston v. Talladega Cnty. Bd. of Educ.*, 997 F.2d 1394, 1407 n.14 (11th Cir. 1993). ("In deciding Title VI disparate impact claims we borrow from standards formulated in Title VII disparate impact cases."). This case law sets forth the legal standard for establishing an adverse disparate impact.

The analysis begins with a determination of whether a *prima facie* case of adverse disparate impact can be established. In order to establish a *prima facie* showing, the Agency must determine: (1) whether a causal connection exists between the recipient's facially neutral action or practice and the allegedly adverse disparate impact; (2) whether the alleged impact is "adverse;" and (3) whether the alleged adversity imposes a disparate impact on an individual or group protected under Title VI. If the Agency cannot establish any one of these *prima facie* elements, then the Agency must make a finding of no violation, and dismiss the complaint. 40 C.F.R. § 7.120(g); *See New York City Envtl. Justice Alliance v. Giuliani*, 214 F.3d 65, 69 (2d Cir. 2000) (citing *Brown v. Coach Stores, Inc.*, 163 F.3d 706, 712 (2d Cir. 1998); *New York Urban League, Inc. v. New York*, 71 F.3d 1031, 1036 (2d Cir. 1995).

If a *prima facie* case of adverse disparate impact is established, the Agency must then determine if the recipient can provide a "substantial legitimate justification" for the action that caused the adverse disparate impact. *Elston*, 997 F.2d at 1413. The justification must be necessary to meet "a legitimate, important goal integral to [the recipient's] mission." *Id.* If the recipient *cannot* provide such justification, then the Agency will find that the recipient violated EPA's Part 7 regulations. If the recipient *can* provide a justification, then the Agency must determine if there was a "less discriminatory alternative" to the recipient's action. *Id.* at 1407. If a less discriminatory alternative did exist, then the Agency will find that the recipient violated EPA's Part 7 regulations. If no less discriminatory alternative existed, then the Agency will make a finding of no violation and dismiss the complaint.

B. Preliminary Findings

OCR has determined that:

1. The Title VI administrative complaint has previously been found to meet jurisdictional criteria for acceptance and investigation by EPA of its allegations of adverse disparate impact on Latino students in California resulting from the registration of MeBr as an agricultural fumigant pesticide by CDPR.

2. The use of MeBr as a pesticide is subject to regulation by both the EPA/OPP and CDPR. In California, registration by CDPR is a prerequisite for use of MeBr as an agricultural fumigant. CDPR's annually renewed decision to register MeBr for agricultural use allows the applications to occur, under the provisions of CDPR regulations.

3. EPA's analysis shows that there was substantial exposure to California school students to MeBr in the 1995-2001 period, before and after the registration decision cited in the complaint, as a result of agricultural fumigations using MeBr. For both subchronic and chronic exposure periods of time, the resulting exposures to these fumigant emissions to nearby residential populations such as public school students are sufficient to constitute an adverse impact under Title VI.

4. These adverse exposure impacts have been higher for Latino students, to a degree that is sufficient to constitute a statistically significant and substantial disparity under Title VI.

5. Actions previously taken by CDPR to adopt revised fumigant regulations in 2001 to reduce exposures to MeBr were not sufficient to mitigate all the adverse disparate impacts.

OCR's analysis which predicted exceedances of health benchmarks in the 1995-2001 time period does not by itself support a determination that similar exceedances existed either at the time of the EPA RED or currently in California. Nearly all of the predicted exceedances concerned long-term exposure periods. Additional long-term monitoring data would provide confirmation that the changes in state and federal regulatory provisions, as well as any changes in agricultural practices, are sufficient to prevent a recurrence of earlier conditions.

Available chronic (Long-term) monitoring data are limited, since most sites are currently located in California urban areas not close to MeBr high-use areas. While there is no indication of exceedance concentrations at those sites, monitoring in high-use areas would be more relevant. CDPR has recently begun long-term multi-chemical data collection in high-use areas. In addition EPA/OPP is has required registrants to fund additional long-term monitoring in California and Florida. An initial analysis of the newly established California long-term monitoring sites indicates that one (or more) monitoring sites in the highest use area would be useful.

Based upon the evidence gathered and reviewed, EPA concluded that there has been a *prima facie* case established for adverse disparate impact from MeBr exposures in California between 1995 and 2001.

C. Conclusion and Voluntary Compliance

[Based upon its investigation as described in this Investigative Report, OCR concluded that there was sufficient evidence to make a preliminary finding of a prima facie violation of Title VI as a result of an adverse disparate impact upon Latino schoolchildren in California from the application of MeBr between 1995 and 2001. EPA informed CDPR of its preliminary finding by letter dated April 22, 2011. OCR and CDPR engaged in discussions to address the concerns set forth in the preliminary finding. Notwithstanding CDPR's objections to OCR's analysis, on August 24, 2011, OCR and CDPR entered into an agreement. In summary, CDPR has committed through the Agreement to expand on-going monitoring of MeBr air concentrations by adding a monitor at or near one of the schools named in the original complaint. The purpose of the additional monitor is to confirm that there will be no recurrence of earlier conditions. CDPR will also extend its data collection activities at two other monitors through 2013. CDPR has also agreed to share the

monitoring results with EPA and the public and will also increase its community outreach and education efforts to schools that are in high MeBr usage areas. EPA is satisfied that CDPR's implementation of the terms in the agreement, in conjunction with a number of other ongoing efforts related to MeBr mitigation by both EPA and the State of California, will help to ensure that adverse disparate impacts from the use of MeBr will not recur. Thus, in accordance with the agreement, OCR is administratively closing the complaint.]

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Appendix A. California Methyl Bromide Regulation

There is a long history of regulation and litigation of methyl bromide (MeBr) in California. Appendix A summarizes the relevant activities which provide a legal context for the assessment and regulation of the pesticide in the state.

1. California Pesticide Regulatory History of Methyl Bromide

The following section describes CDPR's risk assessment efforts concerning MeBr, as well as the regulatory actions it undertook and the litigation that impacted these efforts.

MeBr is one of the few pesticides for which the California Legislature has directed specifically that regulations be developed for. The California Food & Agriculture Code, Sections 14081 and 14082, provide as follows:

> 14081. The director, after investigation and hearing, shall adopt regulations by April 1, 1989, which govern the use of methyl bromide and chloropicrin as field fumigants.
>
> 14082. The director may prescribe the time when, and the conditions under which, methyl bromide and chloropicrin may be used in different areas of the state.

On February 27, 1989, a proposed regulation package was prepared by California Department of Food and Agriculture (predecessor to CDPR for these purposes) and submitted to the Office of Administrative Law (OAL). On March 29, 1989, OAL disapproved the proposed regulations because they did not satisfy the clarity, necessity incorporation by reference, and consistency standard for regulations; omitted documents, did not summarize and respond to comments; and did not comply with procedural requirements. As a result, similar information was distributed to County Agricultural Commissioners (CACs) in the form of an Enforcement Letter. The letter included guidance for program implementation and suggested permit conditions; these suggested permit conditions did not constitute regulatory requirements.

CDPR was created as a separate agency in 1991 and was tasked with developing the MeBr regulations under California law**.** CDPR developed a risk assessment between 1994 and 1999 to assess the risk presented by subchronic exposure to MeBr in California. In October 1999, CDPR issued its Methyl Bromide Risk Characterization Document for Inhalation Exposure.[57] To evaluate the potential risks, CDPR compared the MeBr detected in the air with health based "reference concentrations," (RfCs) which are a type of health-based target levels, are similar to those used by EPA. The reference concentrations are those which, when not exceeded, are likely to be without risk of harmful effects.

[57] CDPR, Methyl Bromide Risk Characterization Document for Inhalation Exposure - Draft (October 15, 1999). http://www.cdpr.ca.gov/docs/dprdocs/methbrom/ra_index.htm .

CDPR's 1999 MeBr risk assessment derived the following RfCs:

acute (one-day) exposure	210 ppb averaged over 24 hours.
one week average exposure	70 ppb for children and 120 ppb for adults
over two to five weeks exposure	54 ppb.
six week exposure average	1 ppb for children and 2 ppb for adults.
chronic	1 ppb for children and 2 ppb for adults.

The types of health effects identified in the assessment included neurotoxicity, developmental effects to a fetus, and lesions of the nasal cavities in test animals. The neurotoxic effects considered in the CDPR subchronic assessments (2-6 week exposure periods) were based on the results of a 1994 dog study [Newton, 1994][58]

In the October 1999 report, CDPR noted that the dog was a more sensitive species to the effects of MeBr exposure than rats, and that the existing 1994 dog study had been conducted for a shorter period of time than the 13 weeks recommended for a neurotoxicity study. The report stated, "It is possible that the [dog's no-effect level] may be lower if the dogs were exposed to methyl bromide for 13 weeks."

The October 1999 CDPR report described the significant chronic effects of MeBr, based on a rodent study, as being "tissue damage … in the nasal cavity, brain, and heart of rodents." The critical no observable effects level was based on "an increase in the number of cells (hyperplasia) and change in cell type and function (degeneration) in the nasal cavity of rats."

CDPR's October 1999 report also discusses the some implications of the chronic exposure animal studies relative to possible human exposure patterns:

> For chronic inhalation exposure, all chronic studies conducted with rodents (rats and mice), the reproductive toxicity study, and the subchronic dog inhalation toxicity study were considered in the determination of the chronic critical NOEL. While the exposure duration in chronic toxicity studies generally lasted for the life-time for rodents, the actual duration of the testing was two years. Since humans may be exposed to methyl bromide on a yearly basis, not just one or two years in the lifetime, the NOEL from the chronic toxicity study after two years of exposure was, therefore, appropriate for use. This NOEL may underestimate the risk of repeated yearly exposure as there is evidence of cumulative toxicity for this endpoint, as well as for neurotoxicity.

[58] See Methyl Bromide Risk Characterization in California, Subcommittee on Methyl Bromide, Committee on Toxicology, Board on Environmental Studies and Toxicology, Commission on Life Sciences, National Research Council 65 (2000).

Under Section 57004 of the California Health and Safety Code, the scientific basis of proposed regulations is subject to external peer review. Accordingly, the National Academy of Science (NAS) undertook such a task and issued Methyl Bromide Risk Characterization in California in 2000.[59] The NAS report stated:

> Although DPR compiled a large quantity of exposure data in its document, the subcommittee concludes that the exposure analysis is lacking in several respects. The DPR report fails to address several exposure scenarios, including exposures of residents living near fumigated fields and increased exposures of residents and workers resulting from methyl bromide treatment of several agricultural fields simultaneously or consecutively.

On July 1, 1998, environmental groups filed a petition for writ of mandate to require promulgation of MeBr regulations. On June 11, 1999, in response to the petition for writ of mandate, the court issued an order to CDPR requiring them to begin the process of adopting amendments to the MeBr field fumigation regulation no later than 60 days after entry of the writ; submit a notice of proposed regulatory action, together with draft regulations to OAL no later than 180 days after entry of the writ; and submit the amended regulations to OAL no later than June 1, 2000.[60]

An initial regulatory package was proposed by CDPR on January 18, 2000. The CDPR regulatory package was not approved by OAL until December 15, 2000, with an effective date of January 14, 2001. Regulations included requirements that CACs impose permit conditions concerning buffer zones, work hour restrictions, notification requirement, and other restrictions to address local conditions. Regulations included minimum requirements concerning buffer zone (inner buffer zone 50 feet, outer buffer zone 60 feet), adjacent owner notification requirements, and field fumigation methods. The primary focus of these regulations was on acute exposure and the buffer zones set forth in the regulations were designed to protect against acute exposures.

These regulations were challenged by both the Ventura County Agricultural Association, on the basis that CDPR had not completed appropriate consultation, and California Rural Legal Assistance, Inc. (CRLA) and the Environmental Defense Fund (EDF), on the basis that regulations did not take into account chronic and subchronic risks. These lawsuits were consolidated in San Francisco County (Regulatory Challenge).

A separate suit was filed by CRLA on behalf of a parent in Monterey County. In August 2001 CRLA requested, and was granted, a temporary restraining order (TRO) in Monterey County due to alleged risks from MeBr application in Monterey County. The TRO provided:[61]

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[59] http://www.nap.edu/books/0309070872/html/

[60] See Judgment Granting Peremptory Writ of Mandate, Friends of the Earth v. CDPR, San Francisco County Superior Court, Case No. 996187. June 11, 1999.

[61] See Temporary Restraining Order, Carillo v. CDRP, et al., Monterey County Superior Court, Case No. M55400. August 31, 2001.

- CDPR and CAC had to take immediate proactive measures to assure that atmospheric concentrations of MeBr as monitored at the La Joya Elementary and Pajaro Middle School did not exceed the 1 ppb reference concentration.
- Within 1,000 feet of either school, the plastic covering any soil application of MeBr had to remain in place and secure for ten days.
- The Court was to be informed immediately if the 1 ppb average was exceeded at either school.

The conditions set forth in the TRO were continued with the granting of a Preliminary Injunction (PI), with the further condition that CDPR was to complete the monitoring it was undertaking at that time as promptly as possible and inform the Court and the parties of the results of the monitoring as soon as possible.[62] CDPR appealed the PI and, as provided under California law, the PI was stayed.

However, this lawsuit was settled in May 2002. Under the terms of the settlement, CDPR would review and consider the regulation of subchronic exposure to MeBr within its re-promulgation of MeBr field fumigation regulations. As part of this process, CDPR would consider a new MeBr inhalation toxicity study in dogs. CDPR also agreed to follow the consultation procedures in AB 1807 in readopting the new regulations. The settlement also stipulated that in the 2002 use season, the Agricultural Commissioner would develop a plan for areas within 1,500 feet of Pajaro Middle School and La Joya Elementary School for MeBr applications, and applications would take place while school was not in session. The preliminary injunction was vacated, and the appeal of the preliminary injunction was to be withdrawn.

On February 21, 2002, a hearing was held in the Regulatory Challenge lawsuit. The San Francisco County Superior Court ruled that the MeBr regulations, which became effective in January 2001, were void because CDPR failed to consult with the California Department of Food and Agriculture (CDFA), as required by the California Food and Agricultural Code, § 11454.2, and the implementing Memorandum of Agreement (MOA) between CDFA and CDPR. The Court did not consider the challenges raised by CRLA and EDF as these were deemed moot, at least for the time. The Court stayed the order for forty-five days to allow for CDPR to file emergency regulations with OAL. The Court issued its decision on April 9, 2002.

On April 16, 2002, CDPR issued press release indicating that it would not appeal the court order in the Regulatory Challenge lawsuit and that it would be submitting emergency regulations (which would be the same as the ones currently in effect) within the forty-five day period provided by the court. CDPR also indicated that it would begin the process for adopting permanent regulations.

In May 2002 the Court extended the stay of its April 9, 2002 order to September 23, 2002 at the

[62] See Preliminary Injunction, Carillo v. CDRP, et al., Monterey County Superior Court, Case No. M55400. November 5, 2001

request of the Ventura County Agricultural Association. CDPR refiled the emergency regulations to replace the regulations voided by the Court order. The emergency regulations were effective on September 22, 2002. The emergency regulations were readopted on January 21, 2003 and were effective through May 21, 2003. The emergency regulations were readopted once again on May 21, 2003 and were effective through September 18, 2003.

In 2001, CDPR initiated a reevaluation of MeBr. Seasonal ambient air monitoring was conducted in the summer and fall of 2001,[63] which showed decreased levels but still included sites with concentrations above the target level. In 2001 and 2002, additional monitoring was conducted by the Alliance of the Methyl Bromide Industry.

On May 21, 2001, CDPR issued Methyl Bromide Subchronic Exposure—Analysis of Data and Risk Management Options.[64] Options discussed by CDPR to reduce the risk of subchronic exposure include: a methyl bromide use cap, time window for fumigation, increased physical or temporal separation between fumigation, and increased buffer zones.

In response to the comments from the NAS, CDPR revised its Risk Characterization Document for Inhalation Exposure and released the revised document on February 14, 2002.[65] Overall, the major change was in the exposure assessment, while there was no change in the critical endpoints or No-Observed-Effects Levels for risk characterization.

CDPR prepared an addendum to its risk assessment in 2003. Specifically, based on the NAS MeBr peer review, MeBr air monitoring, public comments, and a court order (Carrillo v. DPR and Monterey County Agricultural Commissioner) CDPR evaluated the possible effects of subchronic exposure to MeBr as part of its re-promulgation of field fumigation regulations. (Although it reviewed subchronic toxicity concerns, CDPR did not estimate sub-chronic exposure to MeBr in its 1999 Risk Characterization Document**).**

In the 2003 addendum, CDPR evaluated a new inhalation toxicity study in dogs (Shaefer, 2001) and determined that the target air concentration for subchronic (six weeks) exposure should be revised to 16ppb for adults and 9 ppb for children. None of the available monitoring data showed exceedances of this target level.

In identifying reference concentrations, CDPR standard practice is to use two factors of 10 for the interspecies and intraspecies uncertainty factors, which when combined yield a total target MOE of 100. For exposures exceeding the threshold concentration, the corresponding MOE will be less than 100.

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[63] See Notice of Decision to Begin Reevaluation of Certain Methyl Bromide Pesticide Products, http://www.cdpr.ca.gov/docs/registration/canot/ca01-4.pdf

[64] http://www.cdpr.ca.gov/docs/dprdocs/methbrom/sub_exp.pdf

[65] See CDPR, Methyl Bromide Risk Characterization Document for Inhalation Exposure - Final (February 14, 2002). (http://www.cdpr.ca.gov/docs/dprdocs/methbrom/rafnl/mebr_rcd.pdf)

As part of the process for adopting permanent regulations, CDPR held a workshop on February 26, 2003 to receive input from interested parties on the regulatory value selected for subchronic exposure. Comments were received until the end of March 2003.

On March 12, 2003, CDPR convened a Methyl Bromide Interagency Workgroup to discuss the need for an appropriate degree of control measures for acute and subchronic exposures.

The California Office of Environmental Health Hazard Assessment (OEHHA) is tasked with protecting human health and the environment by conducting scientific evaluation of risks. OEHHA submitted comments reflecting its belief that the subchronic exposure levels of 1 ppb for children and 2 ppb for adults was still appropriate on the basis of a 1994 dog toxicity study (the 1994 Newton Study).[66] OEHHA submitted multiple comments to CDPR in 2003 and 2004 recommending no change from the previously identified sub-chronic target air concentration of 1 ppb for children.

In the Fall of 2003, CDPR proposed to permanently adopt MeBr field fumigation regulations focusing on mitigating possible acute (short term) and subchronic (seasonal) MeBr exposure hazards to the public and agricultural employees. The 45-day public comment period closed on December 18, 2003. CDPR held hearings in mid-November in Ventura, Salinas, and Sacramento. In response to the comments received, CDPR made changes to the text from that which was originally proposed.[67]

Further modifications to the regulations were proposed during the summer of 2004. The modifications were made, in part, to ensure that ambient air concentrations of MeBr did not exceed an average daily non-occupational exposure of nine parts per billion in a calendar month. This replaced the proposed limit of 270,000 pounds of MeBr used in any township in any calendar month.

CDPR indicated that the lack of a completed peer review mandated by Health and Safety Code section 57004 on the methodology that derived the 270,000 pounds per month in any township equating to nine parts per billion precluded establishing the limit in regulation at the time. CDPR indicated that in order to ensure that adequate subchronic restrictions were implemented; it was establishing a performance-base standard instead of a prescriptive standard, while still continuing to protect the public from any possible subchronic MeBr exposure.[68]

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[66] Fan, Anna (OEHHA). "Comments on the Risk Characterization Document for Inhalation Exposure to Methyl Bromide, Addendum to Volume 1, Prepared by the Department of Pesticide Regulation," Memorandum, March 11, 2003. See http://www.oehha.ca.gov/pesticides/peer/petsmethylb.html

[67] See, DPR, Status Report for Fumigant Pesticides, July 2004 (http://www.cdpr.ca.gov/docs/dprdocs/methbrom/stat0704.pdf).

[68] See, DPR, Status Report for Fumigant Pesticides, July 2004. http://www.cdpr.ca.gov/docs/dprdocs/methbrom/stat0704.pdf

On November 3, 2004, the OAL approved the MeBr field fumigation regulations that pertain to the use of MeBr when used to fumigate soil prior to the planting of agricultural crops and focuses on mitigating possible acute (short-term) and subchronic (intermediate) methyl bromide exposure hazards to the public and agricultural employees.[69]

On December 2, 2004, CDPR regulations were challenged by a suit filed in San Francisco Superior Court. The suit alleged that the CDPR failed to protect workers and residents from seasonal (sub-chronic) exposure to MeBr. The suit alleged that CDPR:

- Ignored the recommendation of the Office of Environmental Health Hazard Assessment;
- Improperly granted the County Agricultural Commissioners' discretion in reducing buffer zones;
- Did not provide sufficient clarity on respiratory requirements and methods to ensure the performance standard for air concentrations.[70]

On February 24, 2006, the San Francisco Superior Court ruled that CDPR had violated state food and agricultural laws and the Administrative Procedures Act in developing regulations establishing the subchronic exposure limits. Specifically, the Court ruled that CDPR had not relied upon the advice provided by the OEHHA in reaching its decision. CDPR appealed this ruling.[71]

In July 2008, the First Appellate District Court of Appeal affirmed the lower court decision.[72] The District Court of Appeal required DPR to consult with OEHHA in determining the health risks from MeBr and to repromulgate MeBr regulation in conjunction with OEHHA. In 2010, in consultation with OEHHA, CDPR adopted a revised intermediate-term (subchronic) target concentration of 5 ppb in a month.

As a result of this collaboration CDPR promulgated MeBr regulations which revised the limits on the amount of MeBr that could be applied in any calendar month in any township; prohibited CACs from using buffer zone sizes smaller and durations shorter than specified in the Methyl Bromide Field Fumigation Buffer Zone Determination document incorporated by reference; and changed several worker protection provisions. These regulations became effective on November 26, 2010.[73]

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[69] See, DPR, Status Report for Fumigant Pesticides, December 2004. http://www.cdpr.ca.gov/docs/dprdocs/methbrom/stat1204.pdf

[70] See, DPR, Status Report for Fumigant Pesticides, July 2005. http://www.cdpr.ca.gov/docs/dprdocs/methbrom/stat0705.pdf

[71] Fernandez v. California Department of Pesticide Regulation, Cal. Super. Ct., San Francisco Cnty., No. CPF-04-504781, notice of appeal filed 4/24/06)

[72] *Fernandez v. Department of Regulation* (164 Cal. App. 4th 1214)

[73] See http://www.cdpr.ca.gov/docs/legbills/rulepkgs/10-002/text_final.pdf

2. California Volatile Organic Compound Reduction Programs Affecting Methyl Bromide

In several California counties which were in violation of ground-level ambient air ozone standards, additional controls on MeBr application methods were promulgated.[74] This was in response to a 2006 federal court order directing CDPR to reduce emissions of volatile organic compound (VOC) fumigants (seven, including MeBr) to meet ambient ozone target levels in non-attainment areas. The regulations took effect on January 25, 2008, although certain aspects of the requirements were to be phased in. The regulations included revisions to: fumigation methods (in order to eliminate certain "high-emission" application methods), reporting, licensing requirements and cumulative use restrictions. The restrictions on fumigation methods and licensing requirements would apply statewide, while the cumulative usage limits would apply in certain geographic areas.

California identified five major areas subject to the additional proposed controls, the San Joaquin Valley, the Southeast Desert, Ventura County, South Coast and Sacramento Metro areas. The last two areas are meeting their target ozone reduction goals and were given more limited restrictions regarding application methods. In the five areas, the total usage of these pesticides was mandated to decrease by 20% from 1991 usage levels. CDPR would set an overall fumigant use allocation (or cap) for each non-attainment area from May to October.

To remain within allotment and emission limits, fumigant registrants (chemical manufacturers) will track and report applications by type. They also will calculate emissions from each application method used, under CDPR's direction, and report monthly total emissions by method.

Modifications to MeBr fumigant application methods include the elimination of certain "high-emission" application methods. CDPR prohibited non-tarpaulin/shallow bed, non-tarpaulin/deep broadcast, and drip system - hot gas application methods. The remaining allowable methods would all include the use of tarpaulins to reduce emissions. The current maximum application rates per acre for MeBr would not be changed.

In the Ventura area, low-emission applications alone are not expected to meet the VOC reduction target and the proposed regulations may involve other methods such as avoiding fumigant applications in some areas.

[74] See "About New Rules to Control Field Fumigant Emissions," January 2008, http://www.cdpr.ca.gov/docs/dept/factshts/fumigant_controls_new_rules.pdf

Appendix B: Detailed Description of Model Development and Exposure/Disparity Assessment

This Appendix provides a more detailed description of the exposure and disparity analysis process, including the development of a model to predict aggregate concentrations of MeBr from agricultural applications throughout California in the years 1995-2001. Detailed technical reports were produced by ICF, and are listed in the References section of this report as ICF, 2011a, 2011b, 2011c, and 2011d.

A. Model Development

The model development process involved creating and evaluating a number of alternative plausible model formulations containing factors influencing the relationship between usage and exposure. These included alternative representations of MeBr volatilization rates, weather conditions and distance between application sites and receptor locations. This approach used is similar to that published by CDPR to identify the relationship between agricultural MeBr usage and ambient concentrations at nearby locations for proposed regulations.[75]

The ambient monitoring data used for model calibration was collected by the California Air Resources Board (ARB) in 2000 and 2001 at sites in Kern, Monterey and Santa Cruz counties. Daily MeBr concentrations included a wide range of values, over about four orders of magnitude (0.01 to 36 ppb), and included a high proportion of low values (e.g., 29% of monitoring days had concentrations less than 0.1 ppb).

Table 9: ARB Methyl Bromide Monitoring Results 2000-2001

ARB Monitoring Site Location for Subchronic Exposures	Highest 1-Day Concentration (ppb)		Highest 1-Week Concentration (ppb)		Average Concentration for Study Period (ppb)	
	2000	2001	2000	2001	2000	2001
Monterey & Santa Cruz Counties						
Chualar School, Chualar	2.4	1.8	1.6	1.2	0.6	0.6
La Joya Elementary School, Salinas	34.0	14.5	11.1	9.0	3.8	2.8
MacQuiddy Elementary School, Watsonville *	Not sampled	36.6	Not sampled	13.4	Not sampled	5.5
Oak Avenue School, Greenfield	1.8	Not sampled	1.0	Not sampled	0.4	Not sampled
Pajaro Middle School, Watsonville *	30.8	21.1	15.5	10.5	7.7	3.0
Ambient Monitoring Station, Salinas	7.9	9.2	3.0	6.2	1.3	1.4
Salsepuedes Elementary School, Watsonville	16.4	5.3	8.3	2.5	2.6	1.2

[75] Li et al, 2005

ARB Monitoring Site Location for Subchronic Exposures	Highest 1-Day Concentration (ppb)		Highest 1-Week Concentration (ppb)		Average Concentration for Study Period (ppb)	
	2000	2001	2000	2001	2000	2001
Kern County						
ARB Ambient Monitoring Station, Bakersfield	1.00	0.31	0.50	0.19	0.19	0.12
Arvin High School	Not sampled	0.22	Not sampled	0.13	Not sampled	0.08
Cotton Research Station, Shafter	14.20	25.34	4.60	10.04	2.16	2.54
Mettler Fire Station, Mettler	0.20	0.25	0.10	0.13	0.08	0.06
Mountain View School, Lamont	0.50	0.23	0.20	0.14	0.09	0.08
Shafter-Walker Ambient Monitoring Station, Shafter	3.50	Not sampled	1.80	Not sampled	0.79	Not sampled
Vineland School District - Sunset School, Bakersfield	0.30	0.23	0.20	0.15	0.10	0.08
* School also listed in Title VI administrative complaint.						

In 2001, seasonal monitoring was conducted in Ventura and Santa Barbara Counties by the Alliance of the Methyl Bromide Industry (AMBI) between August-October 2001. These data, available at: http://www.cdpr.ca.gov/docs/empm/pubs/tac/tacpdfs/rpt_0402.pdf, showed generally somewhat lower values than the CARB data, but were intentionally located further away from known MeBr usage, and CDPR found that the monitors were systematically shut off when operators became aware of nearby usage. CDPR also identified a number of other study limitations, including trip blank contamination, a high proportion of rejected samples, and a looser standard for rejecting samples with high intake flow variability during collection. AMBI conducted additional seasonal monitoring in 2002 in Ventura, Santa Barbara and Monterey/Santa Cruz counties, for which CDPR also noted study limitations. Due in part to these limitations, the level of effort needed to conduct the quality assurance procedures described below, and the amount of available ARB data, it was decided not to include the additional AMBI data in the model calibration process.

Several quality assurance procedures were conducted for key input data used for model calibration, including verifying or correcting monitoring site locations. The model calibration process included MeBr use data from the computerized California Pesticide Use Reporting (PUR) system. The PUR database contains records for pesticide usage located coded to an approximately 1 square mile area using a meridian/township/range/section (MTRS) format. The enhancements to these data near the monitoring sites in all counties included: reviewing and applying data correction procedures for suspected erroneous entries, obtaining original use reports when available to confirm and update computerized records, and improving spatial locations of usage, in many cases to individual farm fields.[76]

The analysis used two approaches to more precisely estimate the locations of applications relative to monitoring sites. First, a grid of smaller squares (0.25 mile square) than the MTRS grid was developed and overlaid using geographic information system (GIS) to identify MTRS-grid cell

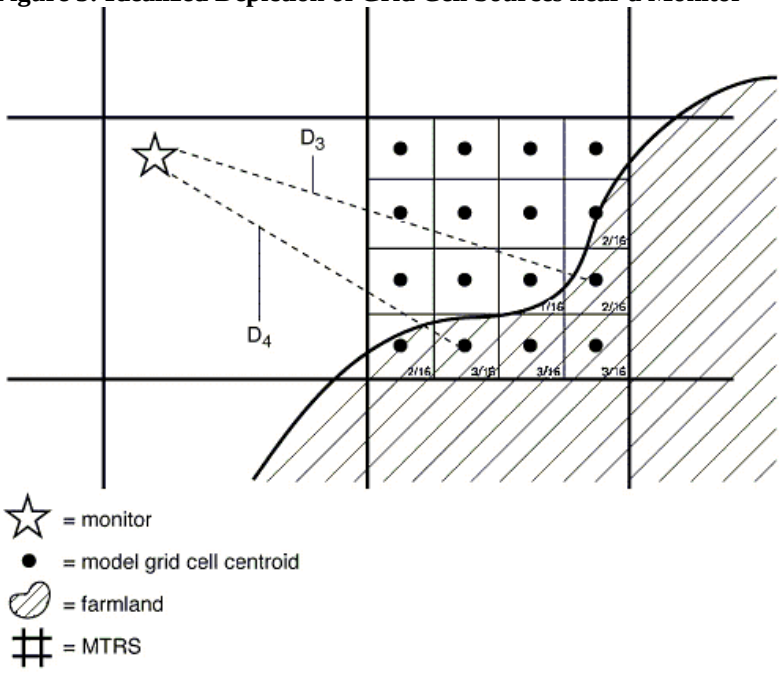
[76] ICF, 2011c.

relationships. Second, MeBr applications were assigned to these cells based on one of two methods, either the proportion of total farmland in the area, or the presence of specific fields with recorded MeBr usage.[77]

While the PUR database contains geographic coding to the MTRS, it also contains references to specific field identifiers. In combination with a grower ID, these field IDs can often be linked to specific field polygons depicted on paper maps included with use reports. Several California counties are actively involved in developed geographic information system (GIS) data layers of digitized field polygons where pesticide applications occur, including Monterey and Santa Cruz counties. For large uses located nearest the monitoring sites (within about 2 miles) during the data collection period, the paper copies allowed assigning usage to field-specific polygons developed either by the county or by EPA.

For uses further away, and for applications could not be assigned to individual fields, usage amounts for an MTRS were assigned to grid cells based on the proportion of total farmland in that cell. Figure 3 illustrates an idealized example of the location of a monitor relative to some MTRS sections, along with the more detailed grid cells used in EPA's evaluation. The shaded area depicts a set of example farmland area that would be used to identify the six cells out of a total of 16 that were located in the MTRS. In this example, usage would be assigned to these cells proportional to the farmland present, and none to the remaining grid cells in the MTRS without farmland.

Figure 3: Idealized Depiction of Grid Cell Sources near a Monitor



[77] ICF, 2011c.

The paper copies of use reports also identify the specific days of applications, while the computerized data only contains a listing of the last day of a multi-day application. For the applications with available reports, the usage was allocated to the specific days listed. For large applications without available reports, a general multi-day allocation procedure was developed based on an analysis of statewide usage patterns which identified a typical maximum daily application rate.

After review of Kern County usage data for 2001, a number of previously non-computerized additional reports were obtained, and the data added to the set for analysis. These additional records accounted for approximately an additional 122,000 lbs. of MeBr usage during the monitoring period, and improved the model calibration results.

Meteorological data, including hourly wind speed and wind direction, ambient temperature and atmospheric stability were obtained from nearby weather monitoring stations and averaged for model input. Two alternative approaches to including weather conditions, either using a single 24 hour average value for the data elements, or separate averages for day and night conditions, were evaluated. For the monitoring sites, the stations used were part of the California Irrigation Management Information System (CIMIS) network.

Using regression analysis, the coefficients for a number of alternative model formulations were derived. As in the approach used by CDPR, models were formulated with alternative sets of maximum distances between 1 and 8 mile radii, corresponding to the 3 to 15 mile diameters examined by CDPR. Some models included separate terms for near and far usages (with distance breaks set at either 3 or 4 miles). Other alternative model components examined included various types of adjustment factors to the usage. These included the inverse distance between usage and monitoring location (to discount the impact of uses farther away from the site); soil volatilization rate profiles derived from application studies; and weather conditions (wind speed, wind direction, temperature. etc).[78]

A regression process then was used to develop coefficients for the terms in each model formulation, based on minimizing the overall mean square error (MSE) of the daily average model predictions. This process was subject to various physically-based constraints such as coefficients being non-negative. The performance of each model formulation with the optimized coefficients was then evaluated and ranked using several summary statistics. These statistics were calculated for daily concentration values, as well as several longer-term averages.

The performance statistics were developed based on the differences between the measured concentrations and the regression predictions (i.e., the errors). The MSE was the primary statistical measure of model performance used here. However, because of the limitations of this measure, several additional criteria were also used. The MSE may be heavily influenced by errors among the highest value observations. For datasets such as the ones used here, with numerous low

[78] ICF, 2011a.

concentration values, the best fit models as defined by the MSE may not necessarily perform well outside the highest part of the concentration data range.

Other statistics used in ranking models included the high (90th percentile) and low (10th percentile) error values, and the proportion of predicted values within a factor of two of the observed values, for each of the various time averaging periods. The 90th percentile error is intended to characterize a maximum likely over-prediction, and is defined as the difference (predicted minus measured) that is exceeded by ten percent of the sample errors. Similarly, the 10th percentile error characterizes the maximum likely under-prediction. The percent within a factor of two provides a measure of acceptable model performance generally used in other EPA model development processes.[79]

CDPR's model development process focused primarily on the monthly to 6/7/8-week subchronic or "seasonal" average concentrations. EPA's study included averages for daily, 2-week, and 4-week as well as a 7/8 week periods, using the three or four days of data collected each week. The longer periods were computed using the averages of the daily predictions. Generally, models will have less success at correctly predicting shorter-term averages. Evaluating the relative performance using several averaging periods like these reduces the likelihood of selecting models that might perform well over a long term average, but fail to predict shorter duration exposures of interest correctly.

Because the regression model was developed for application at receptor locations in California with various conditions, it is important that it provide reasonably good predictions when it is applied to days or sites not used in the fitting of the model. To evaluate this aspect of model performance, cross-validation techniques were used, whereby each regression model formulation is fitted using one subset of monitoring sites or time periods of the available data, but applied to a different subset. In EPA's analysis, cross-validations by monitoring site and by collection year were included. In the site cross-validation, a model formulation fit to all but one site was used to estimate the value of the missing site's observation, and so on through each site in turn. In cross-validation by year, a model formulation derived from fitting with one year of data was used to predict values for the other year of the set, with a similar set of performance statistics computed. These cross-validation measures were included in the model ranking criteria.

Another type of cross-validation was provided by subdividing the monitoring data into two concentration categories, "High" and "Low." For each exposure averaging period compared, the "High" daily values were defined as those with values above the median, and the "Low" values were below the median. The model ranking criteria included performance measures for all and "low" values. Since the performance statistics for all values combined closely paralleled the performance for the "high" values, a separate measure for "high" values was not needed. This approach helped identify model formulations which performed relatively well for both the lower and higher ends of the observed concentration range.

[79] US EPA, 1992

An overall ranking score was created to evaluate each model's performance based on a weighted mix of the ranking criteria. The intent of the scoring process is to identify a small fraction of models for further review and final model selection. The statistical criteria were calculated for combined years of data and for individual year and site cross-validation results, each for multiple time averaging periods (daily, 2 week, 4 week, and 7/8 week averages).

The ranking criteria weights were assigned to make explicit the assumptions concerning the relative importance of the ranking criteria. Among the different exposure averaging periods, daily value comparison statistics were assigned a higher weight than the other periods. Similarly, the mean square error (MSE) statistic was assigned the highest relative weight among the several types of statistical performance measures (MSE, 10th and 90th percentile errors, and the fraction within a factor of two).

The identification of top ranked models was performed several stages. The potential number of alternative model formulations to be examined was large, and it was felt that not all possible alternatives needed be examined fully. In particular, the number of formulations which included separate terms for previous days' usage was impractically large. To limit the number of alternatives, only a subset of model formulations were chosen to include the many alternate day terms possible, by identifying the top-ranked 5000 model formulations out an initial set of over 24,000. Using these more successful formulations as a base, the subset was expanded to include additional formulations with separate terms for previous days (e.g., separate terms for days 0 (the application day), 1, 2, 3, 4, and combined previous days up to 8), resulting in over 31,000 formulations for comparison.

The regression process for a final set of candidate models was constrained so that models would have an intercept value (equivalent to a background concentration) of zero, and with non-negative coefficients. The regression process for the constrained models takes substantially longer time to execute, so again a subset of the best ranked model formulations was chosen for additional evaluation. Overall, the top ranked 3211 model formulations (about 10% of the initially developed models), together with 11 models including unadjusted total usage only, were regressed using constraints on coefficient values.

As previously mentioned, the basic approach EPA used to formulate tested models was somewhat different from CDPR's, and focused primarily on model daily average performance, as well as performance statistics for three other averaging periods. For comparison, the final set of models examined included two types similar to the formulation used by CDPR, based on both daily usage and weekly usage. The original CDPR approach used weekly average usage to predict air concentrations. In the CDPR approach, concentrations were estimated based on MeBr usage that was not adjusted by proximity (distance between source and receptor), or by weather conditions. The tested versions of these included the same location and usage corrections and updates as for the other tested models, as well as the usage allocation to smaller grid cells with farmland. The models with CDPR-analogous daily usage formulation included the total unadjusted usage for the concentration day, along with the previous days.

A subset of the ranking criteria was needed for evaluating the weekly-based formulations, since

these did not estimate daily concentration values. Overall, EPA's study found many models with better-ranked performance than the weekly average or the daily average CDPR-analogue models. The daily average CDPR analogue version with the highest overall ranking score had a usage area radius of 5 miles, was ranked 2405 among the 3211 constrained models.

In addition to the 3211 models mentioned, a set of 8 additional model formulations based on weekly average usage data, similar to that used in the development of the original CDPR model, were included in the evaluation. The weekly average CDPR-analogue model with the best model performance had an emission area radius of 4 miles (i.e., summing usage up to 3 MTRS sections away from the receptor MTRS section). The rank of this model was 2036 out of 3219 based on the subset of criteria used to compare both constrained and weekly average CDPR-analogue models. The 5 mile CDPR daily analogue model ranked 1695 out of 3219 when using only the subset of criteria used to compare both constrained and weekly average CDPR-analogue models.

Some exposure periods of interest (e.g., chronic, including six month and annual averages) extend beyond the time period for which model estimates can be directly compared to observed values. However, model performance steadily improved as averaging periods became longer, so they should perform at least as well in computing these averages as for the 7/8 week period included. Performing well for both All and Low concentration ranges is also a surrogate predictor for the expected contribution of low concentration days likely to be found in long-term averages.

OCR also conducted a technical peer review of its exposure modeling development approach. A contractor provided support in identifying potential reviewers, providing compensation to reviewers as subcontractors, and managing the review process by distributing materials and receiving comments from reviewers. Those materials included an earlier draft model development documentation, which was provided to scientists outside of EPA for peer review, along with a set of charge questions to guide the review process. The results of the review are presented in a contractor report.[80] After receiving the comments, a response-to-comments document was prepared,[81] and the model development process was updated.

Using the calculated performance ranking criteria, a set of 100 top-performing models (about 0.3% of the original set of formulations) was identified for final review. Several preferences were identified for the final model evaluation and choice. Generally, models with formulations incorporating known physical processes are preferred, especially ones similar to Gaussian air models. Another EPA-recommended element for model evaluation that was used was the fractional bias (a measure of an overall tendency to under- or over-estimate).[82] Model coefficients were also examined to discard very small, non-influential values. Model coefficient confidence intervals were examined by a statistical significance test, to identify ones that were broad enough to encompass a zero coefficient value, i.e., that were not statistically significantly different from zero.

[80] Eastern Research Group, 2005.

[81] ICF, 2011d.

[82] US EPA, 1992.

CDPR also conducted technical peer reviews of its model development, which identified several statistical issues that were explored in its most recent model development process. The peer reviewer had raised the several statistical issues about an earlier version of the CDPR regression model. The model development documentation describes these concerns in more detail, and presents an analysis of their implications.[83] Generally, the process of estimating model coefficients using linear regression might be improved in some respects by using an alternative approach. The coefficients for leading candidate models were re-estimated by alternate means, and the resulting modified models' performance compared.

The performance of the modified models using the ranking criteria is better in some respects and worse in others. For example, the modified models had higher mean square errors, generally lower R2 values, higher 90th percentile errors (i.e., over-predictions), and lower percentages within a factor of 2. On the other hand they generally had smaller 10th percentile errors (i.e., under-predictions). Overall, this resulted in a slightly higher positive fractional bias. This performance changes were not considered sufficient to warrant application of one of the modified models to create the primary set of exposure and disparity estimates used in EPA's analysis.[84]

The adjusted usage variables used in the selected model were based on:

- grid cell pounds of MeBr applied for the current day and previous 14 days (in proportion to the defined daily emission profile) for all grid cells within 8 miles of a receptor;
- wind speed, wind direction, and temperature at the primary (typically, the nearest) meteorological station and, to substitute for incomplete primary station data, at the secondary meteorological station[85]; and
- inverse or the distances between grid cells and receptors.

The final model selected was Model 19, the highest overall ranked model that accounts for the influence of both day time and night time meteorological conditions on nearby usage, was consistent with physical principles of atmospheric dispersion, and had no positive but non-significant coefficients. This model had three adjusted usage variables, as follows:

[83] ICF, 2011a.

[84] An alternative model developed with corrections to one major statistical issue was used to create an alternate set of exposure and disparity results. Consistent with the ranking performance measures, the exposure results generally included a slightly higher number of predicted exceedances, and at a larger number of schools. Disparity results were also similar. See ICF, 2011f for more details.

[85] Meteorological data, including hourly wind speed and wind direction, and ambient temperature were obtained from nearby California Irrigation Management Information System (CIMIS) or National Weather Service (NWS) monitoring stations. Each monitoring site had both a primary and a secondary weather station identified as a source of relevant data. When the necessary data were not available for particular days needed, the missing data were either interpolated or obtained from the secondary station records. (ICF, 2011c)

- Dayusagexaed. Coefficient = 7.523E-05. Usage within 3 miles, adjusted for:
  - daytime temperature[86]
  - daytime wind direction[87]
  - emission profile for daily deep, no tarp application method emission rates[88]
  - distance (inverse)
- Nightusageaewd. Coefficient = 5.299E-03. Usage within 3 miles, adjusted for:
  - nighttime wind speed
  - nighttime wind direction
  - emission profile for daily deep, no tarp application method emission rates
  - distance (inverse)
- Dayegasuxed. Coefficient = 3.973E-05. Usage between 3 and 8 miles, adjusted for:
  - daytime temperature;
  - emission profile for daily deep, no tarp application method emission rates;
  - distance (inverse)

The predicted 24-hour daily average (from 10 am to 10 am) concentration value is the sum of these three variables multiplied by the given coefficients. Longer term concentrations are composed of the averages of the daily values.

B. Exposure Analysis Input Data Development

Similar procedures were applied to validate key input data for the statewide exposure analysis as for the model calibration process. These included checking for usage and location errors, assigning very large applications over a multiple-day period, and allocating usage more precisely to 0.25 mile grid cells based on the presence of farmland. For the areas near schools listed in the Title VI complaint, usage was often assigned to the specific fields, such as those developed during the calibration process, and then to the associated grid cells, for applications occurring between 1998 and 2001. Prior to 1998, the usage was consistently assigned using the general farmland data. In addition, the location of all school sites initially identified as exceeding an exposure threshold were re-checked, and the operating period of the schools during each year in which an exceedance was predicted was verified. [89]

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[86] To adjust for the temperature, usage was multiplied by the average degree-hours above 4ºC. For each hour, the degree-hours above 4ºC equals zero if the temperature is at most 4ºC and equals the temperature minus 4ºC if the temperature is above 4ºC.

[87] To adjust for the wind direction, usage was multiplied by a factor representing the component of the wind direction that lay on the line connecting the center of the grid cell of methyl bromide usage and the school location.

[88] Adjustment factors reflect the post-application temporal profile of emissions out-gassing for day 0 (application day), day 1 (next day), day 2, up to day 14, according to an empirical curve fitted to measured concentrations from agricultural experiments by CDPR For the deep no tarp method CDPR's analysis indicated that on average 32 % of the applied pesticide is emitted over the application day 0, 25 % on the following day, and so on. Use of this profile does not assume that all applications were conducted in this manner, as the model coefficients weight the relative emissions to derive a final concentration.

[89] ICF, 2011b.

The assessment's database development report describes these activities in more detail.[90] For the allocation of MeBr usage to grid cells, a statewide combined farmland database was developed, based on 3 state data sources. The types of crops primarily associated with the farmland was considered in the combination process, and were chosen as ones that pesticides are used with, and excluded pasture lands. The process then assigned usage linked to each MTRS to the overlapping detailed grid cells using a combination of field-specific data where available and the presence of statewide farmland. Usage was assigned first to fields if possible, and both the usage and field acreage was deducted from any remaining usage allocation to other farmland in the MTRS.

The investigation obtained school locations and characteristics from a combination of federal and state sources, and identified years of operation. Some schools that were not likely to represent the locations of schoolchildren were excluded, including those that listed the same address as the district headquarters, schools located at prisons, and home-school offices with a listed address but no onsite students, etc. The California and federal schools inventory data were cross-checked and reconciled to identify a set of over 8400 public schools that were in operation at some time between 1995 and 2001.

The school location data were evaluated in order to develop at least medium-quality location data for all schools included in the analysis. This approach used a hierarchy of location estimation methods, starting with the least expensive, such as address matching. After obtaining initial locations, the schools which were likely to be potentially significant, either because of a large student population, or because they had been previously identified as located in or near high MeBr use areas, were further reviewed and improved if deficient. High-quality locations were collected for all schools listed in Title VI complaint. The locations of all possibly high-exposed schools identified in a preliminary prediction of were also reviewed, and corrected as needed before the final exposure assessment. In addition, locations of schools with predicted exposure exceedances that had not been previously verified were reviewed, and in some cases, excluded from the analysis as being of insufficient quality.

Meteorological data were obtained from nearby weather stations using a process which checked for relevance to local conditions as well as of station record data completeness. The process of identifying which weather station's data to use relied on proximity to each modeled school location, as well as the relative elevation and other factors. Where particular station records were incomplete, additional data was derived from other nearby stations to fill the data gaps.[91]

C. Exposure Analysis Modeling Procedures

The exposure model was used to estimate daily air concentrations in 1995-2001 for each school with nearby MeBr usage data (within an 8 mile radius). Average concentrations were not calculated

[90] ICF, 2011c
[91] ICF, 2011c.

for particular calendar months or other periods. Rather, the daily estimates were averaged for the exposure scenario time period, with the starting and ending dates of the period by examining all the days in the seven-year study period, and identifying the combination of exposure periods that would result in the maximum number of average estimated concentrations above the relevant health benchmark.[92]

The estimated number of children exposed was derived from the estimated calendar year school enrollment during the year(s) of predicted exceedances. Generally, this involved averaging the enrollment figures across school years if more than one school year was involved, or if the exceedance occurred in the summer. [93]

D. Health benchmark review

EPA's Integrated Risk Information System (IRIS) is designed to capture an Agency-consensus set of available toxicity data for a wide range of regulated chemicals. The IRIS documentation for defines RfC as:

> An estimate (with uncertainty spanning perhaps an order of magnitude) of a continuous inhalation exposure [for a short-, intermediate- or long-term duration] to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations of the data used.

Generally, an assessor must identify the highest-quality, most relevant animal study(ies) available for particular time periods and exposure pathway (e.g., inhalation or ingestion). EPA has published guidelines and sometimes particular protocols for conducting such studies, e.g., for specific health effects and/or test species. Based on the data from the most appropriate study(ies), as well as information from other supporting sources, an assessor determines the health effects (or "endpoints") the chemical has on exposed organisms, and which effects are "critical" (i.e., most likely to be observed at relatively lower dose levels, and considered serious enough to potentially warrant protection). Often, the critical effect is an effect that is observed (e.g., is significantly elevated in the dose group) at the lowest dose, with increased incidence of this effect at higher doses. Sometimes different species may exhibit an effect at different doses, and the dose associated with the most sensitive species is identified.

Dose-response data from toxicity animal studies are used to identify a "no observable adverse effect level" (NOAEL), or exposure level at which no effects are observed in the most sensitive species over the period of exposure. When there is no well-designed study which provides a NOAEL, the

[92] An alternative approach was also used which chose starting and ending dates which would maximize the concentration values for each exposure averaging period. See ICF, 2011b for more information.
[93] ICF, 2011b.

"lowest observable adverse effect level" (or LOAEL) is used instead as a lower boundary, with additional considerations, such as division by a factor of 3 or 10 to estimate a NOAEL.[94]

Once the critical toxicity values have been estimated from animal studies, the second step is the calculation of an exposure level for humans which corresponds to that of a study. This involves adjusting for such factors as the relative difference in body weights, breathing rates, and exposure duration between the test animals and humans, to derive a human equivalent concentration (HEC).

Next, two or more "uncertainty factors" (UFs) may be applied to reflect limitations of the data used. The most common of these are intended to take into account the uncertainty associated with extrapolating effect levels in humans from animal studies. For non-carcinogenic chemicals, inhalation reference concentrations (RfCs) and reference doses (RfDs) generally are based on a NOAEL that has been divided by such UFs. Multiplying all the UFs together provides a total value of all included "traditional" uncertainty factors.

The two most commonly included factors are designed to address interspecies variability, that humans are often more sensitive to a particular toxic effect than laboratory animals (UF_A); and the variability of responses within exposed human populations (intraspecies variability, or UF_H), because the genetically diverse human population contains individuals who are more sensitive to toxic effects than average. Default values for each of these two factors is 10, but may be reduced for particular chemicals depending on data availability.

Thus, the commonly resulting total 100-fold factor typically includes two components: a 10x factor for interspecies differences and 10x factor for variation in sensitivity among individual humans. Depending on the nature of the critical endpoint, the quality of the available studies, the overall state of knowledge concerning the mechanism of toxicity, and other factors, EPA may apply combined uncertainty factors of more or less than 100 in setting RfCs and RfDs.[95]

OPP's approach is similar to the approaches used by ORD's National Center for Environmental Assessment (NCEA) to develop RfCs and RfDs, but it has some variations. OPP derives a value somewhat similar to the RfC or RfD, called the Population Adjusted Dose (PAD). The PAD is equal to an RfD divided by any additional "special FQPA safety factor." The FQPA added a requirement that an additional 10x default safety factor must be added to protect children unless EPA determines that a higher or lower factor should be used. For MeBr, EPA determined that this safety factor was not needed (i.e., could be reduced to a factor of 1x).

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[94] Some assessments fit a model to the dose-response relationship and interpolate a benchmark concentration (or the corresponding oral benchmark dose), usually the exposure at which 5-10 percent of the study population is predicted to respond. The 95% lower confidence limit on the benchmark concentration/dose (BMCL/DL) replaces the use of the NOAEL and better represents all of the data of the dose-response curve.

[95] EPA guidelines for reviewing animal data include uncertainty factors (UFs) addressing concerns in addition to interspecies and intra-human variability, including a "database uncertainty factor" to account for deficiencies in the toxicity database, whether involving flaws in the critical study or the absence of a complete set of effects testing (UF_{DB}).

Neurotoxicity is the major hazard concern for MeBr inhalation exposure, with neurotoxic effects seen throughout the data base in all tested species of animals. Both acute and 90-day inhalation neurotoxicity studies in rats showed evidence of neurotoxic effects characterized by decreased activity, tremors, ataxia and paralysis. Two subchronic studies showed dogs to be the most sensitive species to the neurotoxic effects of MeBr. Neurotoxic effects were also seen in the chronic/carcinogenicity inhalation study in mice (ataxia, limb paralysis, degenerative changes in the cerebellum) and in the developmental inhalation study in rabbits (lethargy, right side head tilt, ataxia). Risk assessment endpoints for the general population were based primarily on neurotoxic effects. For long-term inhalation effects, nasal lesions in rats were found to be the critical effect.

In the review of the short- and intermediate-term effects of MeBr, EPA determined that with a standard dosiometric adjustment, the animal-to-human variability (interspecies) uncertainty factor could be reduced to 3, and adopted a 10x uncertainty factor for human (intraspecies) variability. No additional uncertainty factors or a special FQPA safety factor were found necessary to include. Therefore, the total of the combined uncertainty factors used to adjust the PAD was 30 (i.e., the PAD was divided by 30 to determine the target threshold). The combined uncertainty factors of 100 for chronic effects reflect a factor of 10 for intraspecies uncertainty, a factor of 3 for the use of a LOAEL for a mild effect, and a factor of 3 for interspecies extrapolation because dosimetric adjustments have been applied.[96]

E. Disparity assessment

Student populations for schools in this assessment were obtained from either federal or state Department of Education databases. Enrollment data for each school year were used, and proportionally combined if needed to estimate populations for particular date ranges.

When evaluating potentially affected populations across multiple years of exceedances, the following procedures were used:

- Assume one grade's proportion of population changes each year (e.g. for schools with 4 grades, 25% changes per year)
- Compute total affected population across years by adding estimated unique population at each school
- Do not attempt to estimate students who transition from one affected school to another neighboring affected school

To evaluate the potential disparity in predicted exposures above a target threshold for California schoolchildren, identification of a comparison population was needed. For purposes of comparative analysis it is usually better not to include the population identified as potentially

[96] US EPA, Integrated Risk Information System, Bromomethane, http://www.epa.gov/iris/subst/0015.htm

affected as part of the comparison population, so that the two sample groups are statistically independent, leading to a simpler statistical analysis.

For this investigation, a suitable comparison population was the set of school children attending California public schools where the predicted MeBr concentration was predicted to be below a health benchmark (i.e., non-affected school populations). Together, the affected and non-affected subgroups comprise the entire set of students enrolled in California public schools. All these school children could potentially have been affected had the proximate MeBr usage been sufficiently high and the meteorological conditions been favorable to high and/or sustained ambient concentrations.

It might be argued that not all schools are located sufficiently close to MeBr use to be potentially affected by methyl bromide. However, EPA's analysis indicates that farmland in California is so ubiquitous that 84% of California schools could be exposed to potentially significant MeBr concentrations. (See Appendix E of this document, and Appendix C of the ICF, 2011b report). Because the geographic analysis did not address the possibility of concurrent methyl bromide applications on clusters of agricultural parcels, 84% may be an underestimate of the schools. Thus, we believe it is reasonable to assume that virtually all California schools are potentially affected. However, even if only schools located within 5 miles of farmland of 40 acres or larger in size were considered, the total proportion of Latino schoolchildren at those schools is virtually the same, or even slightly lower, than for all public schools. A lower proportion of Latino students in the comparison population would have made identification of a substantial disparity ratio value more likely.

For this analysis, therefore, the comparison population was the set of students enrolled at California public schools that were predicted not to experience an exceedance during the assessment period. This comparison may be either in a particular calendar year for the yearly analyses, or across all affected calendar years for the aggregate analysis.

The disparity analysis was carried out for each modeled year separately as well as for an aggregate over the modeling period, and Table 17 includes the individual year results as well as the summaries across years. The table lists the range and mean of the annual total affected population across the modeled years, and of the Threshold Risk Ratio and Demographic Ratio values defined above.

The tables in Appendix D give most of the details of the disparity analyses for individual years and for the aggregated analyses over the entire period. For each individual year and for the 7-year aggregate data (year = "Agg"), we report:

- the affected and unaffected populations of Latinos and non-Latinos;
- the threshold risk probabilities pr1 and pr2;
- the Threshold Risk Ratio pr1/pr2;
- the demographic probabilities pr3 and pr4; and
- the Demographic Ratio pr3/pr4.

In the rows where year = "Avg" we report the averages of the Threshold Risk Ratio and Demographic Ratio over the modeled years. The results of the associated tests of significance (e.g., the Fishers exact test) are included in the detailed spreadsheets which accompany the contractor report.[97]

An example scenario illustrates the detailed data. In the case of the schools and students predicted to have concentrations exceeding 1.3 ppb averaged over a year (365 days), the total size of the estimated affected population varies by year, as does the Threshold Risk Ratio and Demographic Ratio. From Table 17 in Appendix D, the total affected population ranges between about 18,800 (in 1995) and 56,400 (in 1999), with about 34,000 in 2001. The fraction of the total Latino student population that is predicted to be in the affected group (the probability of a Latino student being in the affected group, or pr1) ranges between about 0.7% to 1.8%, the fraction of a non-Latino student population that is predicted to be in the affected group (pr2) ranges between about 0.1% and 0.4%, and the Threshold Risk Ratio ranges between about 2.4 and 6.9. Across all years, the aggregate total estimated affected population is about 126,800, with an aggregate ratio of about 3.5, and a simple average Threshold Risk Ratio of about 4.0.

The mean (across years) values of the ratio are a simple average of the yearly values. The aggregate values are combinations of the yearly values weighted by the predicted exposed population in each year.

Table 17, which provides the yearly values of the ratios, can be used to examine the temporal patterns for the total "affected" populations and the disparity ratios. There's a pattern of generally increasing affected population from 1995 through 1999, with decreases thereafter. There were generally small decreases in disparity over the 1995-2001 period. However, both disparity ratios remain substantially above 1.0 even at the end of the study period. For the Threshold Risk Ratio, a Latino student was more than twice as likely as a non-Latino student to be in the affected population in 2001 for all the long-term EPA benchmark scenarios.

[97] ICF, 2011b.

Appendix C: Detailed Listings of Schools with Exceedances by Exposure Scenario

List of Tables

Table 10: Schools with Predicted Short-Term Exceedances in 1995-2001 (>35ppb in 7 days)

Name	County	Start Dates	Latino	Non-Latino	Total
Mar Vista Elementary	Ventura	08/19/00	538	54	591
Rio del Valle Elementary	Ventura	09/11/00	511	134	644
Rio Mesa High	Ventura	07/28/99,07/30/01	2,348	1,379	3,727
TOTAL			3,396	1,567	4,963

Table 11: Schools with Exceedances of 1.3ppb in 182 days in 1995-2001 (168 schools)

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
03/21/95#,02/07/96,08/07/96,02/05/97, 08/06/97,02/04/98,08/05/98,02/03/99,08/04/99,02/02/00,08/02/00, 01/31/01	Ventura	Rio Mesa High	3970	2243	6212
03/08/95#,09/06/95,03/23/96,09/21/96, 03/22/97,09/20/97,03/21/98,09/19/98,03/20/99,09/18/99,03/22/00, 09/20/00,03/21/01	Monterey	Pajaro Middle	1591	105	1696
03/19/95#,09/17/95,03/30/96,09/28/96, 03/29/97,03/20/98,09/18/98,03/25/99,09/23/99,03/27/00,03/25/01	Santa Cruz	MacQuiddy (T. S.) Elementary	1900	180	2080
03/13/95#,02/26/96,08/26/96,02/26/97, 02/25/98,08/26/98,02/24/99,12/31/99,06/30/00,01/21/01	Ventura	Rio Plaza Elementary	947	129	1076
05/10/95#,04/10/97,04/09/98	Monterey	Barton (Virginia Rocca) Elementary	1656	48	1704
03/05/95#,09/03/95,03/21/96,09/19/96, 03/20/97,09/18/97,03/19/98,09/17/98,03/18/99,09/16/99,03/16/00, 09/14/00,03/15/01	Monterey	Ohlone Elementary	1264	56	1320
04/10/96,03/30/97,03/18/98,03/28/99	Kern	Independence High (Cont.)	173	45	218
05/19/96,04/07/97,03/19/98,03/30/99	Kern	Wasco High	1795	546	2341
10/21/95*	Merced	Delhi High	0	0	0
04/24/95#,05/08/96,04/23/97,04/19/98, 04/11/99,04/27/00	Monterey	North Monterey County High	1501	2124	3625
05/08/95#,05/13/96,05/04/97,05/03/98,04/14/99,04/22/00,04/25/01	Monterey	El Camino High (Cont.)	121	109	230
03/16/95#,04/16/96,03/15/97,03/16/98,04/18/99,04/19/00,04/29/01	Monterey	Alisal High	4936	270	5207
04/26/95#,05/12/96,04/23/97,04/18/98,04/12/99,04/28/00	Monterey	North Monterey Co.Ctr for Independent Study	174	611	785
04/26/95#,05/12/96,04/23/97,04/18/98,04/12/99,04/28/00	Monterey	Central Bay High (Cont.)	73	18	91
05/09/95#,04/01/97,04/12/98	Monterey	Alvarez (Everett) High	1779	601	2380
05/15/95#,04/24/96,05/12/97	Monterey	North Salinas High	1675	1361	3036
05/24/99	Santa Barbara	Righetti (Ernest) High	785	1808	2594
05/31/95#,04/10/96,04/17/97,04/11/98,03/23/99,09/21/99,04/10/00	Santa Barbara	Santa Maria High	5419	1796	7215
03/22/95*#,09/20/95*,03/31/96*,09/29/96*,03/30/97,03/25/98,09/23/98,03/26/99,09/24/99,03/28/00,03/24/01	Santa Cruz	Pajaro Valley Community Day	82	2	84

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
03/28/95*#,09/26/95*,04/13/96*,03/22/97*,09/20/97*,04/08/98*,04/03/99,04/02/00,04/12/01	Santa Cruz	Academic/Vocational Institute	82	23	104
04/05/95#,10/04/95,04/03/96,04/01/97,03/31/98,04/02/99,03/27/00	Santa Cruz	Renaissance High (Cont.)	498	112	610
03/22/95#,09/20/95,03/30/96,09/28/96,03/29/97,03/23/98,09/21/98,03/25/99,09/23/99,03/27/00,03/24/01	Santa Cruz	Watsonville High	6357	1042	7399
05/07/97	Sonoma	Buena Vista High	5	9	14
05/13/99	Sonoma	Marce Becerra Academy (Cont)	18	26	45
05/07/97	Sonoma	Geyserville Educational Park High	42	89	131
01/28/01	Ventura	Pacific High (Cont.)	115	142	256
01/28/01	Ventura	El Camino High (Alter).	46	189	236
04/13/95*#,03/09/96*,03/23/97*,03/10/98*,01/31/99*,08/01/99,02/04/00,08/04/00,02/02/01	Ventura	Pacific View High (Com Day)	113	42	155
02/23/97,02/26/98,08/27/98,02/25/99,02/06/00,08/06/00,02/04/01	Ventura	Camarillo (Adolfo) High	951	4397	5349
04/14/95#,03/17/96,03/14/98,01/27/99,07/28/99,02/06/00,08/06/00,02/04/01	Ventura	Channel Islands High	4789	2197	6986
03/13/99,02/27/00,02/12/01	Ventura	Hueneme High	3142	964	4107
03/09/95#,02/17/96,01/05/97,07/06/97,02/11/98,12/24/98,06/24/99,12/23/99,06/22/00,12/21/00,06/21/01	Ventura	Oxnard High	4565	2840	7405
07/26/98	Imperial	Westside Elementary	39	44	83
04/08/96,04/05/97,03/18/98,03/30/99	Kern	Clemens (Karl F.) Elementary	1571	303	1875
04/06/97,03/22/98,03/31/99	Kern	Palm Avenue Elementary	1129	263	1392
04/10/96,05/20/97,03/19/98,03/31/99	Kern	Jefferson (Thomas) Middle	1099	336	1434
04/03/95#,04/26/96,02/17/97,03/24/98	Monterey	Alisal Community (Elem)	1543	71	1615
04/12/95#,02/17/96,02/11/97,03/15/98,04/11/99,04/22/00,04/27/01	Monterey	Bardin Elementary	1812	106	1918
05/12/97	Monterey	Fremont Elementary	848	21	869
06/06/95#,05/02/97,04/27/98	Monterey	Sanchez (Jesse G.) Elementary	1421	44	1466
06/05/95#	Monterey	Graves Elementary	39	11	50
05/28/99,04/11/00,04/09/01	Monterey	Lagunita Elementary	13	62	76

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
05/10/95#,05/04/97,05/03/98,04/26/99	Monterey	Castroville Elementary	748	195	943
05/02/95#,04/27/96,04/23/97,04/22/98,04/11/99,04/19/00, 05/01/01	Monterey	Elkhorn Elementary	655	550	1205
05/13/95#,04/30/97,05/07/98,04/21/99	Monterey	Gambetta (Joseph) Middle	760	502	1262
05/08/95#,05/18/96,05/07/97,05/06/98,04/20/99,04/27/00,05/02/01	Monterey	Prunedale Elementary	680	629	1309
04/20/95#,05/15/96,03/16/97,03/31/98,04/07/99	Monterey	Loma Vista Elementary	851	264	1115
05/31/95#	Monterey	Monterey Park Elementary	274	193	467
05/14/95#,05/13/96,05/05/97,04/26/99	Monterey	Natividad Elementary	1184	359	1543
03/17/95#,09/15/95,03/15/96,03/15/97,03/13/98,03/16/99,03/10/00 ,03/02/01	Monterey	La Joya Elementary	1055	859	1914
04/01/95#,03/21/96,04/14/97,03/29/98,04/22/99,04/10/00, 04/26/01	Monterey	Santa Rita Elementary	1465	610	2075
10/31/97	San Diego	Pendleton (Mary Fay) Elem.	90	611	702
05/17/95#	San Joaquin	Van Allen Elementary	57	107	164
06/25/99	Santa Barbara	Bonita Elementary	72	7	79
04/25/99	Santa Barbara	Alice Shaw Elementary	151	456	607
04/29/99	Santa Barbara	Lakeview Junior High	122	372	494
04/30/98,04/15/99	Santa Barbara	Nightingale (Joe) Elementary	295	582	876
04/25/95#,04/08/96,04/16/97,04/08/98,03/19/99,09/17/99, 04/09/00	Santa Barbara	Adam (William Laird) Elementary	1629	255	1884
04/17/96,04/22/97,04/16/98,04/02/99,04/20/00	Santa Barbara	Alvin Elementary	958	259	1217
05/07/99	Santa Barbara	Arellanes (Don Juan Bautista) Elementary	668	152	820
04/15/96,04/21/97,04/12/98,04/01/99,04/20/00	Santa Barbara	El Camino Elementary	2240	366	2607
04/12/96,04/19/97,04/07/98,03/31/99,04/21/00	Santa Barbara	Fairlawn Elementary	1317	89	1406
04/16/96,04/20/97,04/21/98,04/01/99,09/30/99,04/12/00, 04/26/01	Santa Barbara	Fesler (Isaac) Elementary	2122	884	3006
04/29/97,04/22/98,04/17/99,04/21/00	Santa Barbara	Tunnell (Martin Luther) Elementary	531	604	1135
04/10/96,04/17/97,04/13/98,03/22/99,09/20/99,04/09/00	Santa Barbara	Miller (Isaac) Elementary	934	436	1369
05/04/95#,04/14/96,04/20/97,04/02/98,10/01/98,04/09/99,04/21/00	Santa Barbara	Oakley (Calvin C.) Elementary	1295	251	1546

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
05/07/97,04/21/98,04/15/99,04/22/00	Santa Barbara	Rice (William) Elementary	826	483	1309
04/15/96,04/21/97,04/10/98,04/04/99,04/21/00	Santa Barbara	Bruce (Robert) Elementary	1416	122	1538
03/24/95#,09/22/95,04/14/96,03/24/97,09/22/97,04/09/98,04/02/99,04/14/00,04/04/01	Santa Cruz	Amesti Elementary	1322	255	1578
04/28/95#	San Benito	Aromas Elementary	175	403	578
05/16/95#	Santa Cruz	Bradley Elementary	87	406	493
03/29/95#,04/25/96,03/30/97,04/19/98,04/11/99,04/22/00	Santa Cruz	Calabasas Elementary	1388	234	1621
03/23/95#,09/21/95,03/31/96,09/29/96,03/30/97,03/24/98,09/22/98,03/27/99,09/25/99,03/29/00,03/26/01	Santa Cruz	Hall (E.A.) Middle	3474	281	3755
03/30/95#,04/11/96,03/25/97,04/07/98,04/05/99,04/10/00,04/14/01	Santa Cruz	Freedom Elementary	1615	107	1721
03/29/95#,04/07/96,03/20/97,09/18/97,03/30/98,09/28/98,03/29/99,09/27/99,04/02/00,04/02/01	Santa Cruz	Hyde (H. A.) Elementary	1518	181	1700
04/04/95#,04/12/96,04/01/97,04/10/98,04/01/99,04/06/00,04/04/01	Monterey	Hall District Elementary	1937	148	2085
03/18/95#,09/16/95,03/27/96,09/25/96,03/26/97,09/24/97,03/25/98,09/23/98,03/24/99,09/22/99,03/26/00,09/24/00,03/25/01	Santa Cruz	Linscott Charter	115	214	329
03/24/95#,09/22/95,04/01/96,09/30/96,03/31/97,03/25/98,09/23/98,03/28/99,09/26/99,03/30/00,03/26/01	Santa Cruz	Mintie White Elementary	1477	92	1569
03/22/95#,09/20/95,04/06/96,10/05/96,04/05/97,04/01/98,09/30/98,03/31/99,09/29/99,03/29/00,03/31/01	Santa Cruz	Rolling Hills Middle	2978	406	3384
03/21/95#,09/19/95,04/08/96,10/07/96,04/07/97,03/27/98,09/25/98,03/30/99,09/28/99,04/02/00,03/23/01	Santa Cruz	Salsipuedes Elementary	1376	194	1570
03/21/95#,09/19/95,03/31/96,09/29/96,03/30/97,03/25/98,09/23/98,03/25/99,09/23/99,03/28/00,03/24/01	Santa Cruz	Alianza Elementary	1837	216	2053
05/11/95#,04/17/96	Sonoma	Alexander Valley Elementary	40	115	155
05/16/99	Tulare	Liberty Elementary	88	160	248
05/21/95#	Tulare	Outside Creek Elementary	41	85	126
06/07/95#	Tulare	Union Elementary	287	82	369
04/08/96,02/11/99,02/15/00,02/02/01	Ventura	Larsen (Ansgar) Elementary	1529	130	1659
03/15/00,02/22/01	Ventura	Haycox (Art) Elementary	991	94	1084
02/27/99,02/25/00,02/09/01	Ventura	Green (E. O.) Junior High	1349	689	2038
04/28/95#,03/07/96,03/12/98,02/08/99,02/09/00,08/09/00,02/07/01	Ventura	Williams (Fred) Elementary	875	740	1615
02/02/01	Ventura	Hollywood Beach	34	268	302

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
		Elementary			
02/26/99,02/21/00,02/06/01	Ventura	Hathaway (Julien) Elementary	794	261	1055
03/27/00,02/24/01	Ventura	Parkview Elementary	705	188	893
03/04/99,03/06/00,02/22/01	Ventura	Sunkist Elementary	941	181	1122
03/13/96,03/15/97,02/27/98,08/28/98,02/26/99,02/23/00,02/02/01	Ventura	Mesa Elementary	356	486	842
01/13/95#,07/14/95,01/27/96,07/27/96,02/21/97,08/22/97,02/20/98,08/21/98,02/19/99,08/20/99,02/18/00,08/18/00,02/16/01	Ventura	Laguna Vista Elementary	452	681	1133
02/19/95#,02/13/96,08/13/96,02/21/97,02/15/98,08/16/98,02/14/99,08/15/99,02/13/00,08/13/00,02/11/01	Ventura	Mar Vista Elementary	1249	121	1370
02/21/95#,02/13/96,02/26/97,02/12/98,02/02/99,08/03/99,02/01/00,08/01/00,01/30/01	Ventura	Tierra Vista Elementary	933	476	1410
03/05/95#,03/07/96,02/28/97,03/01/98,01/29/99,07/30/99,01/28/00,07/28/00,02/05/01	Ventura	Curren Elementary	1319	281	1600
03/22/95#,03/26/96,03/16/98,02/04/99,08/05/99,02/06/00,02/09/01	Ventura	Driffill Elementary	2040	219	2259
03/23/95*#,03/22/96,03/15/98,02/03/99,08/04/99,02/12/00,01/26/01	Ventura	Elm Street Elementary	722	118	839
03/28/95#,03/27/96,03/21/98,02/05/99,08/06/99,02/13/00,01/27/01	Ventura	Harrington Elementary	1773	137	1910
04/02/95*#,02/07/99,08/08/99,02/11/00,02/09/01	Ventura	Haydock (Richard B.) Intermediate	1514	257	1771
03/12/95#,02/27/96,02/16/97,02/17/98,01/24/99,07/25/99,01/23/00,07/23/00,02/06/01	Ventura	Fremont Intermediate	3218	2176	5393
02/26/95#,08/27/95,03/12/96,03/16/97,02/28/98,01/29/99,07/30/99,02/05/00,08/05/00,02/03/01	Ventura	Chavez (Cesar E.) Elementary	2001	51	2052
02/12/99,02/16/00,02/09/01	Ventura	Kamala Elementary	1337	120	1457
02/22/99,02/09/00,02/16/01	Ventura	Marina West Elementary	1030	354	1384
02/09/99,08/10/99,02/11/00,02/11/01	Ventura	McKinna Elementary	1280	66	1346
02/28/95#,02/19/96,02/23/97,02/16/98,01/29/99,07/30/99,01/28/00,07/28/00,01/26/01	Ventura	Rose Avenue Elementary	1901	336	2237
03/19/95#,03/04/96,02/16/97,02/27/98,01/29/99,07/30/99,01/28/00,07/28/00,02/04/01	Ventura	Sierra Linda Elementary	1336	331	1667
03/21/98,02/15/00,02/09/01	Ventura	Camarillo Heights Elementary	107	648	755

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
03/18/97,03/19/98,02/06/00,02/02/01	Ventura	Dos Caminos Elementary	210	594	804
03/05/96,02/25/97,03/09/98,03/06/99,02/10/00,02/02/01	Ventura	El Descanso Elementary	326	504	830
03/14/96,02/20/97,02/25/98,02/20/99,02/07/00,08/07/00,02/05/01	Ventura	El Rancho Structured Elementary	482	310	792
03/14/96,03/05/97,03/09/98,03/05/99,02/19/00,02/05/01	Ventura	Las Posas Elementary	162	662	823
03/17/96,02/21/97,03/01/98,02/23/99,02/07/00,08/07/00,02/05/01	Ventura	Los Altos Intermediate	481	1268	1749
02/27/97,03/11/98,03/14/99,02/07/00,08/07/00,02/05/01	Ventura	Los Nogales Elementary	185	516	700
03/01/96,02/25/97,03/09/98,03/05/99,02/11/00,02/02/01	Ventura	Monte Vista Intermediate	342	1499	1840
03/09/95#,02/27/96,08/27/96,02/25/97,02/24/98,08/25/98,02/23/99,08/24/99,02/22/00,08/22/00,02/20/01	Ventura	El Rio Elementary	1024	293	1317
03/03/95#,09/01/95,03/01/96,08/30/96,02/28/97,02/19/98,08/20/98,02/18/99,08/19/99,02/17/00,08/17/00,02/15/01	Ventura	Rio del Valle Elementary	2052	583	2635
02/25/95#,08/26/95,03/05/96,09/03/96,03/04/97,02/11/98,02/02/99,08/03/99,02/01/00,08/01/00,01/30/01	Ventura	Rio Lindo Elementary	808	360	1168
03/01/95#,08/30/95,03/01/96,08/30/96,02/28/97,02/18/98,02/01/99,08/02/99,01/31/00,07/31/00,01/29/01	Ventura	Rio Real Elementary	1376	123	1499
01/29/01	Ventura	Blanche Reynolds Elementary	140	344	485
02/15/01	Ventura	Elmhurst Elementary	200	413	612
03/30/96,03/17/00	Ventura	Juanamaria Elementary	449	497	945
03/10/96,03/22/98,02/27/99,01/29/00,07/29/00,02/02/01	Ventura	Serra (Junipero) Elementary	387	1175	1562
03/17/97,03/12/98,02/14/99,12/30/99,06/29/00,01/06/01	Ventura	Montalvo Elementary	510	319	829
03/06/00,02/23/01	Ventura	Mound Elementary	78	593	671
02/20/01	Ventura	Pierpont Elementary	42	245	287
03/06/96,03/21/98,03/24/99,02/14/00,01/30/01	Ventura	Saticoy Elementary	497	724	1221
02/20/01	Ventura	Anacapa Middle	273	734	1007
03/02/96,02/27/97,03/09/98,03/04/99,02/13/00,02/04/01	Ventura	Valle Lindo Elementary	226	581	806
02/21/95#,02/13/96,08/13/96,02/23/97,02/17/98,01/31/99,08/01/99,01/30/00,07/30/00,01/28/01	Ventura	Ocean View Jr High	1533	863	2396
04/06/98	Orange	El Camino Real Elementary	47	632	679
03/30/95#	Orange	Los Naranjos Elementary	57	439	496

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
02/14/99,02/19/00,02/10/01	Ventura	San Miguel Elementary	19	7	26
03/16/98,02/23/99	Orange	Westwood Basics Plus (Elementary)	34	570	604
03/05/96,02/25/97,03/09/98,03/06/99,02/10/00,02/02/01	Ventura	Bedford Open Elementary	43	348	391
02/23/96,02/06/97,02/16/98,02/01/99,08/02/99,02/06/00,08/06/00,02/04/01	Ventura	Los Primeros Structured Elementary	162	699	861
03/21/99,01/27/00,02/09/01	Ventura	Portola Elementary	241	529	771
03/18/98,03/01/99	Orange	Santiago Hills Elementary	31	876	908
06/03/95#	Tulare	Farmersville Junior High	370	75	445
03/07/95#,03/02/96,03/13/97,02/19/98,12/16/98,06/16/99,01/22/00,07/22/00,01/20/01	Ventura	Lemonwood Elementary	1505	338	1843
03/14/97,03/07/98	Orange	Northwood Elementary	79	652	732
03/16/98,02/23/99	Orange	Sierra Vista Middle	68	930	998
05/03/95#,04/10/97,03/31/98	Monterey	Frank Paul Elementary	1148	103	1251
03/19/95#,03/23/96,03/14/98,02/03/99,08/04/99,02/09/00,02/05/01	Ventura	Nueva Vista Intermediate	60	20	80
03/09/98	Orange	Brywood Elementary	37	604	642
03/09/00	Ventura	Las Colinas Elementary	106	998	1103
03/26/95#,01/14/96,07/14/96,03/22/97,03/13/98,03/28/99,03/15/00,03/11/01	Monterey	Gavilan View Middle	1673	1221	2894
05/07/97	Sonoma	Geyserville Middle	39	80	118
05/03/95#,04/08/96,04/16/97,04/10/98,03/21/99,09/19/99,04/06/00,10/05/00,04/24/01	Santa Barbara	Battles (George Washington) Elementary	1361	340	1701
03/23/96	Orange	Springbrook Elementary	45	578	622
02/13/99,08/14/99,02/12/00,01/01/01,07/02/01	Ventura	McAuliffe (Christa) Elementary	933	624	1556
03/27/95#,09/25/95,04/05/96,10/04/96,04/04/97,03/26/98,09/24/98,03/27/99,09/25/99,03/28/00,03/30/01	Santa Cruz	Starlight Elementary	1458	183	1641
05/25/97	Solano	Wilson (Gale B.) Elementary	90	841	931
05/11/99	Sonoma	Foss Creek Elementary	180	258	438
04/15/95#,03/04/97,04/02/98,04/06/99	Monterey	Steinbeck (John E.) Elementary	493	503	997
03/17/95#,02/22/96,02/06/97,08/07/97,02/10/98,01/20/99,07/21/99	Ventura	Ritchen (Emilie) Elementary	1083	1148	2231

Beginning Dates	County	School Name	Latino Population	Non-Latino Population	Total Population
,01/19/00,07/19/00,01/31/01					
02/17/95#,08/18/95,03/07/96,03/03/97,02/12/98,01/22/99,07/23/99,02/03/00,08/03/00,02/01/01	Ventura	Frank (Robert J.) Intermediate	4569	350	4919
03/22/97,03/15/98,02/06/00,02/04/01	Ventura	Tierra Linda Elementary	150	1276	1426
03/09/95*#,09/07/95*,03/30/96,09/28/96,03/29/97,09/27/97,03/28/98,09/26/98,03/27/99,09/25/99,03/26/00,03/25/01	Santa Cruz	Lakeview Middle	1889	494	2384
03/21/98	Imperial	Cahuilla Desert Academy (Jr. High)	857	14	871
04/16/95*#,04/05/97,03/23/98	Monterey	Chavez (Cesar) Elementary	887	42	929
02/14/95*#,08/15/95*,03/05/96*,09/03/96*,03/04/97*,02/01/98,08/02/98,01/31/99,08/01/99,01/30/00,07/30/00,01/28/01	Ventura	Brekke (Norman R.) Elementary	1177	111	1288
03/25/95*#,09/23/95*,04/05/96*,10/04/96*,04/04/97*,03/27/98*,09/25/98*,03/27/99,09/25/99,03/28/00,03/30/01	Santa Cruz	Rising Star	9	0	9
10/21/95*	Merced	Delhi Middle	0	0	0
04/11/95*#,02/28/97*,04/03/98,04/07/99	Monterey	Creekside Elementary	302	165	467
11/12/98,11/09/99	San Diego	Stuart Mesa Elementary	233	627	860
03/11/96*,04/11/99,02/15/00,02/04/01	Ventura	Citrus Glen	245	476	721
03/14/95*#,09/12/95*,03/30/96*,09/28/96*,03/29/97*,09/27/97*,03/28/98*,09/26/98*,03/27/99,09/25/99,03/26/00,09/24/00,03/25/01	Santa Cruz	Soldo (Ann) Elementary	834	47	881

Notes:

Exceedance began before 15 June 1995. School population assumed to be the same as for school year 1995-1996.

*Exceedance omitted from disparity analysis due to non-operation at the time of exceedance.

Schools displayed in bold text were named in the Title VI complaint.

Table 12: Schools with Exceedances of 1.3 ppb in 365 days 1995-2001 (91 schools)

School Name	County	Start Dates	Latino Population	Non-Latino Population	Total Population
Clemens (Karl F.) Elementary	Kern	09/19/97,08/06/99	1,044	194	1,237
Independence High (Cont.)	Kern	08/10/97,08/03/99	168	37	205
Bardin Elementary	Monterey	08/19/96	818	59	877
Central Bay High (Cont.)	Monterey	11/12/96,10/10/98	43	12	55
Gavilan View Middle	Monterey	05/06/95#,05/05/96	591	472	1,063
La Joya Elementary	Monterey	01/01/95#,01/01/96,09/16/97,10/02/98,10/09/99	912	799	1,711
Lagunita Elementary	Monterey	09/05/00	10	48	58
North Monterey Co.Ctr for Independent Study	Monterey	11/12/96,10/10/98	93	325	418
North Monterey County High	Monterey	11/12/96,10/09/98	952	1,366	2,318
Ohlone Elementary	Monterey	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,12/31/99,12/30/00	1,264	56	1,320
Pajaro Middle	Monterey	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,12/31/99	1,402	97	1,499
Santa Rita Elementary	Monterey	07/11/95	589	259	848
Adam (William Laird) Elementary	Santa Barbara	09/28/97,09/28/98	882	131	1,013
Battles (George Washington) Elementary	Santa Barbara	09/27/97,09/27/98,09/27/99	871	208	1,079
Bruce (Robert) Elementary	Santa Barbara	09/19/98	805	83	888
El Camino Elementary	Santa Barbara	09/21/98	719	125	844
Fairlawn Elementary	Santa Barbara	08/28/98	741	52	793
Fesler (Isaac) Elementary	Santa Barbara	10/14/98	581	236	817
Miller (Isaac) Elementary	Santa Barbara	09/18/98,09/18/99	668	296	965
Oakley (Calvin C.) Elementary	Santa Barbara	10/04/97,10/05/98	860	161	1,021
Santa Maria High	Santa Barbara	09/16/98,09/16/99	3,112	949	4,062
Academic/Vocational Institute	Santa Cruz	01/01/95*#,08/26/96*	0	0	0

School Name	County	Start Dates	Latino Population	Non-Latino Population	Total Population
Alianza Elementary	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,08/23/00	1,723	215	1,938
Amesti Elementary	Santa Cruz	01/01/95#,05/18/96,05/18/97,09/30/98	961	227	1,187
Freedom Elementary	Santa Cruz	09/13/96,08/22/98	986	76	1,062
Hall (E.A.) Middle	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,08/24/00	3,405	280	3,685
Hyde (H. A.) Elementary	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98	1,330	152	1,482
Lakeview Middle	Santa Cruz	01/01/95*#,01/01/96,12/31/96,12/31/97,12/31/98,09/03/00	1,825	490	2,316
Linscott Charter	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,12/31/99	107	200	307
Macquiddy (T. S.) Elementary	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,08/24/00	1,880	180	2,059
Mintie White Elementary	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,08/28/00	1,436	91	1,527
Pajaro Valley Community Day	Santa Cruz	01/01/95*#,01/01/96*,12/31/96,12/31/97,12/31/98,08/23/00	76	2	78
Renaissance High (Cont.)	Santa Cruz	01/01/95#	177	58	235
Rising Star	Santa Cruz	01/01/95*#,01/01/96*,12/31/96*,12/31/97*,12/31/98	6	0	6
Rolling Hills Middle	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98	2,332	343	2,675
Salsipuedes Elementary	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98	1,141	161	1,302
Soldo (Ann) Elementary	Santa Cruz	01/01/95*#,01/01/96*,12/31/96*,12/31/97*,12/31/98,12/31/99	682	38	720
Starlight Elementary	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98	1,182	162	1,344
Watsonville High	Santa Cruz	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,12/31/99	5,434	944	6,378
Alexander Valley Elementary	Sonoma	10/10/95	33	93	126
Bedford Open Elementary	Ventura	07/28/00	21	162	182
Brekke (Norman R.) Elementary	Ventura	01/01/95*#,01/01/96*,12/31/96,12/31/97,12/31/98,12/31/99,12/30/00	1,367	118	1,485
Camarillo (Adolfo) High	Ventura	06/05/97,06/05/98,07/24/99,07/25/00	941	4,384	5,324
Camarillo Heights Elementary	Ventura	08/21/00	65	365	431
Channel Islands High	Ventura	08/08/98,08/08/99,08/07/00	2,986	1,264	4,250
Chavez (Cesar E.) Elementary	Ventura	01/01/95#,08/03/98,08/03/99,08/02/00	1,852	49	1,902

School Name	County	Start Dates	Latino Population	Non-Latino Population	Total Population
Citrus Glen	Ventura	08/10/00	188	365	553
Curren Elementary	Ventura	08/14/96,07/30/98,07/30/99,07/29/00	1,098	224	1,323
Dos Caminos Elementary	Ventura	09/09/99,09/08/00	151	404	555
Driffill Elementary	Ventura	08/24/98,08/24/99	1,125	113	1,237
El Descanso Elementary	Ventura	07/28/00	162	213	375
El Rancho Structured Elementary	Ventura	08/15/99,08/14/00	348	212	560
El Rio Elementary	Ventura	08/27/95,08/26/96,09/08/97,09/08/98,09/08/99,09/07/00	957	270	1,227
Elm Street Elementary	Ventura	08/25/98,08/25/99,08/24/00	616	103	719
Frank (Robert J.) Intermediate	Ventura	01/01/95#,07/23/96,07/21/98,07/21/99,07/20/00	4,364	340	4,704
Fremont Intermediate	Ventura	06/27/96,07/20/98,07/20/99,07/19/00	2,261	1,520	3,780
Green (E. O.) Junior High	Ventura	08/15/00	788	383	1,171
Harrington Elementary	Ventura	08/31/98,08/31/99,08/30/00	1,046	59	1,105
Hathaway (Julien) Elementary	Ventura	08/04/00	559	175	733
Haydock (Richard B.) Intermediate	Ventura	08/30/98,09/13/99	1,080	196	1,276
Kamala Elementary	Ventura	07/14/99,08/21/00	983	75	1,059
Laguna Vista Elementary	Ventura	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,12/31/99,12/30/00	452	681	1,133
Larsen (Ansgar) Elementary	Ventura	09/08/99,09/07/00	869	53	921
Las Posas Elementary	Ventura	08/03/00	82	316	398
Lemonwood Elementary	Ventura	06/01/98,06/01/99,05/31/00	950	210	1,160
Los Altos Intermediate	Ventura	08/18/99,08/17/00	274	682	956
Los Nogales Elementary	Ventura	09/03/99,09/02/00	130	311	441
Los Primeros Structured Elementary	Ventura	08/04/96,07/29/98,07/29/99,07/28/00	149	640	789
Mar Vista Elementary	Ventura	01/01/95#,01/01/96,06/12/97,06/12/98,06/12/99,06/11/00	1,011	114	1,125
Marina West Elementary	Ventura	06/28/99	709	279	988
McAuliffe (Christa)	Ventura	01/17/99,01/17/00	830	557	1,387

School Name	County	Start Dates	Latino Population	Non-Latino Population	Total Population
Elementary					
McKinna Elementary	Ventura	10/01/98	780	55	834
Mesa Elementary	Ventura	09/14/97,09/14/98,08/04/00	312	428	740
Montalvo Elementary	Ventura	06/10/99,06/09/00	330	210	540
Monte Vista Intermediate	Ventura	07/29/00	149	602	752
Nueva Vista Intermediate	Ventura	08/23/98,08/23/99,08/22/00	36	13	48
Ocean View Jr High	Ventura	08/05/95,06/06/98,06/06/99,06/05/00	1,138	671	1,809
Oxnard High	Ventura	05/11/96,05/11/97,06/03/98,06/03/99,06/02/00	3,700	2,292	5,992
Pacific View High (Com Day)	Ventura	08/09/98*,08/09/99,08/08/00	97	37	134
Rio del Valle Elementary	Ventura	01/01/95#,01/01/96,12/31/96,12/31/97,12/31/98,12/31/99,12/30/00	2,052	583	2,635
Rio Lindo Elementary	Ventura	01/01/95#,01/01/96,12/31/96,07/22/98,07/22/99,07/21/00	806	356	1,163
Rio Mesa High	Ventura	07/24/95,07/23/96,07/23/97,07/23/98,07/23/99,07/22/00	3,617	2,053	5,670
Rio Plaza Elementary	Ventura	08/21/95,08/20/96,09/09/97,09/09/98,09/09/99,09/08/00	864	115	978
Rio Real Elementary	Ventura	01/01/95#,01/01/96,12/31/96,04/22/98,04/22/99,04/21/00	1,262	116	1,378
Ritchen (Emilie) Elementary	Ventura	06/20/96,06/20/97,06/20/98,06/20/99,06/19/00	919	996	1,915
Rose Avenue Elementary	Ventura	05/25/95#,05/24/96,07/29/98,07/29/99,07/28/00	1,894	333	2,227
Saticoy Elementary	Ventura	07/26/00	201	260	461
Serra (Junipero) Elementary	Ventura	07/29/99,07/31/00	196	580	776
Sierra Linda Elementary	Ventura	06/29/96,07/28/98,07/28/99,07/27/00	1,238	305	1,543
Tierra Vista Elementary	Ventura	08/06/95,06/09/98,06/09/99,06/08/00	746	398	1,144
Valle Lindo Elementary	Ventura	07/30/00	107	272	379
Williams (Fred) Elementary	Ventura	05/01/99,04/30/00	499	413	912
Total Population			91,198	35,602	126,797

Notes:
Exceedance began before 15 June 1995. School population assumed to be the same as for school year 1995-1996.
*Exceedance omitted from disparity analysis due to non-operation at the time of exceedance.

Table 13: Schools with Exceedances of 1.3 ppb in 182 days 2 times in same year in 1995-2001 (64 schools)

ID	Name	County	Years	Latino	Non-Latino	Total
6102925	Gavilan View Middle	Monterey	1996	447	348	795
6026652	La Joya Elementary	Monterey	1995	367	383	750
6108138	Ohlone Elementary	Monterey	1995,1996,1997,1998,1999,2000	1,166	49	1,215
6049753	Pajaro Middle	Monterey	1995,1996,1997,1998,1999,2000	1,402	97	1,499
6045959	Adam (William Laird) Elementary	Santa Barbara	1999	702	105	806
6107007	Battles (George Washington) Elementary	Santa Barbara	1999,2001	907	203	1,109
6046015	Fesler (Isaac) Elementary	Santa Barbara	1999	581	236	817
6046031	Miller (Isaac) Elementary	Santa Barbara	1999	542	260	802
6046049	Oakley (Calvin C.) Elementary	Santa Barbara	1998	657	142	799
4236030	Santa Maria High	Santa Barbara	1999	2,433	738	3,171
6049829	Alianza Elementary	Santa Cruz	1995,1996,1998,1999	1,181	204	1,385
6049639	Amesti Elementary	Santa Cruz	1995,1997	648	193	841
6049688	Hall (E.A.) Middle	Santa Cruz	1995,1996,1998,1999	2,691	253	2,944
6049704	Hyde (H. A.) Elementary	Santa Cruz	1997,1998,1999	1,065	118	1,183
6112841	Lakeview Middle	Santa Cruz	1996,1997,1998,1999	1,252	391	1,643
6049720	Linscott Charter	Santa Cruz	1995,1996,1997,1998,1999,2000	107	200	307
6049803	Macquiddy (T. S.) Elementary	Santa Cruz	1995,1996,1998,1999	1,544	159	1,703
6049746	Mintie White Elementary	Santa Cruz	1995,1996,1998,1999	1,123	82	1,206
4430203	Pajaro Valley Community Day	Santa Cruz	1998,1999	38	1	39
4437794	Renaissance High (Cont.)	Santa Cruz	1996	181	55	236
6114391	Rising Star	Santa Cruz	1999	6	0	6
6049787	Rolling Hills Middle	Santa Cruz	1995,1997,1998,1999	2,186	327	2,513
6049795	Salsipuedes Elementary	Santa Cruz	1995,1997,1998,1999	1,119	158	1,277
6117253	Soldo (Ann) Elementary	Santa Cruz	1999,2000	682	38	720
6108146	Starlight Elementary	Santa Cruz	1995,1997,1998,1999	1,164	161	1,325
4437901	Watsonville High	Santa Cruz	1995,1996,1998,1999	4,491	826	5,316

ID	Name	County	Years	Latino	Non-Latino	Total
6114029	Brekke (Norman R.) Elementary	Ventura	1998,1999,2000	1,091	63	1,154
5631619	Camarillo (Adolfo) High	Ventura	1998,2000	697	3,307	4,004
5631742	Channel Islands High	Ventura	1999,2000	2,490	1,055	3,545
6055321	Chavez (Cesar E.) Elementary	Ventura	1995,1999,2000	1,625	46	1,671
6055263	Curren Elementary	Ventura	1999,2000	747	148	895
6055271	Driffill Elementary	Ventura	1999	964	99	1,063
6055420	El Rancho Structured Elementary	Ventura	2000	295	192	487
6055487	El Rio Elementary	Ventura	1996,1998,1999,2000	768	255	1,023
6055289	Elm Street Elementary	Ventura	1999	255	55	311
6111850	Frank (Robert J.) Intermediate	Ventura	1995,1999,2000	2,629	200	2,828
6055313	Fremont Intermediate	Ventura	1999,2000	987	729	1,716
6055297	Harrington Elementary	Ventura	1999	730	46	776
6055305	Haydock (Richard B.) Intermediate	Ventura	1999	707	125	832
6055164	Laguna Vista Elementary	Ventura	1995,1996,1997,1998,1999,2000	386	630	1,016
6100333	Lemonwood Elementary	Ventura	1999,2000	849	187	1,036
6055446	Los Altos Intermediate	Ventura	2000	192	512	704
6055453	Los Nogales Elementary	Ventura	2000	104	267	370
6096838	Los Primeros Structured Elementary	Ventura	1999,2000	115	487	603
6055172	Mar Vista Elementary	Ventura	1996,1998,1999,2000	923	103	1,025
6107551	McAuliffe (Christa) Elementary	Ventura	1999,2001	925	623	1,549
6055354	McKinna Elementary	Ventura	1999	780	55	834
6055123	Mesa Elementary	Ventura	1998	208	290	498
6056147	Montalvo Elementary	Ventura	2000	261	159	420
6102487	Nueva Vista Intermediate	Ventura	1999	25	9	35
6084891	Ocean View Jr High	Ventura	1996,1999,2000	1,117	665	1,782
5634548	Oxnard High	Ventura	1997,1999,2000,2001	3,751	2,327	6,078
5630330	Pacific View High (Com Day)	Ventura	2000	73	24	97
6055495	Rio del Valle Elementary	Ventura	1995,1996,1998,1999,2000	1,723	501	2,224

ID	Name	County	Years	Latino	Non-Latino	Total
6055503	Rio Lindo Elementary	Ventura	1995,1996,1999,2000	677	333	1,010
5634761	Rio Mesa High	Ventura	1996,1997,1998,1999,2000	3,257	1,744	5,001
6055511	Rio Plaza Elementary	Ventura	1996,1998,2000	746	106	852
6055529	Rio Real Elementary	Ventura	1995,1996,1999,2000	1,237	113	1,350
6110738	Ritchen (Emilie) Elementary	Ventura	1997,1999,2000	802	871	1,673
6055370	Rose Avenue Elementary	Ventura	1999,2000	1,113	205	1,318
6056105	Serra (Junipero) Elementary	Ventura	2000	148	501	648
6055388	Sierra Linda Elementary	Ventura	1999,2000	823	210	1,034
6055180	Tierra Vista Elementary	Ventura	1999,2000	534	251	785
6055057	Williams (Fred) Elementary	Ventura	2000	421	342	763
TOTAL				63,857	23,562	87,417

Notes:
Exceedance began before 15 June 1995. School population assumed to be the same as for school year 1995-1996.
*Exceedance omitted from disparity analysis due to non-operation at the time of exceedance.

Table 14: Schools with Exceedances of 1.3 ppb for 30 days 6 times in same year in 1995 - 2001 (23 schools)

School_ID	County	School Name	Affected years	Latino Population	Non-Latino Population	Total Population
5634761	Ventura	**Rio Mesa High**	2000	1607	884	2491
6049753	Monterey	**Pajaro Middle**	1995	482	42	524
6055511	Ventura	**Rio Plaza Elementary**	2000	463	64	528
5630330	Ventura	Pacific View High (Com Day)	2000	73	24	97
5634548	Ventura	Oxnard High	1997,1999	2745	1721	4466
6026652	Monterey	La Joya Elementary	2000	512	415	927
6049787	Santa Cruz	Rolling Hills Middle	1995	943	184	1127
6055057	Ventura	Williams (Fred) Elementary	2000	421	342	763
6055164	Ventura	Laguna Vista Elementary	1995,1996,1999,2000	374	621	995
6055172	Ventura	Mar Vista Elementary	2000,2001	776	60	836
6055180	Ventura	Tierra Vista Elementary	2000	457	214	671
6055271	Ventura	Driffill Elementary	1999	964	99	1063
6055313	Ventura	Fremont Intermediate	1999	613	491	1104
6055370	Ventura	Rose Avenue Elementary	2000	961	178	1139
6055495	Ventura	Rio del Valle Elementary	2000	511	134	644
6055503	Ventura	Rio Lindo Elementary	2000	403	197	599
6055529	Ventura	Rio Real Elementary	2000	698	58	757
6084891	Ventura	Ocean View Jr High	2000	476	256	732
6100333	Ventura	Lemonwood Elementary	1999,2000	849	187	1036
6102925	Monterey	Gavilan View Middle	2000	568	450	1017
6107551	Ventura	McAuliffe (Christa) Elementary	1999	684	490	1174
6110738	Ventura	Ritchen (Emilie) Elementary	1999	501	586	1087
6114029	Ventura	Brekke (Norman R.) Elementary	2000	810	53	863
		Total population		16,891	7,750	24,640

Note: Schools displayed in bold text were named in the Title VI complaint.

Table 15: Schools with Exceedances of 2.6 ppb in 182 Days and of 1.3 ppb in 182 Days in the Same Year, for 2 Years in a Row in 1995-2001 (21 schools)

School_ID	County	School Name	Years (starting in)	Latino Population	Non-Latino Population	Total Population
5634761	Ventura	**Rio Mesa High**	1996,1997,1998,1999,2000	2424	1267	3690
6049753	Monterey	**Pajaro Middle**	1995,1996,1997,1999,2000	716	55	770
6049803	Santa Cruz	**Macquiddy (T. S.) Elementary**	1996,1997,1999	611	80	692
6055511	Ventura	**Rio Plaza Elementary**	1999,2000	360	51	411
6108138	Monterey	**Ohlone Elementary**	1995,1996,1997,1999,2000	823	36	859
5634548	Ventura	Oxnard High	1997,1999,2000,2001	1914	1179	3093
6049720	Santa Cruz	Linscott Charter	1997,1999,2000	59	105	165
6049795	Santa Cruz	Salsipuedes Elementary	1995,1996,1997,1999	581	89	670
6055164	Ventura	Laguna Vista Elementary	1998,1999,2000	185	312	497
6055172	Ventura	Mar Vista Elementary	1999,2000	387	45	431
6055313	Ventura	Fremont Intermediate	1999,2000	297	238	534
6055370	Ventura	Rose Avenue Elementary	1999,2000	824	148	972
6055388	Ventura	Sierra Linda Elementary	1999,2000	561	149	709
6055487	Ventura	El Rio Elementary	1999,2000	409	139	549
6055495	Ventura	Rio del Valle Elementary	1999,2000	255	65	321
6055529	Ventura	Rio Real Elementary	1999,2000	493	50	543
6100333	Ventura	Lemonwood Elementary	1999,2000,2001	714	158	872
6107007	Santa Barbara	Battles (George Washington) Elementary	1999,2000	534	132	666
6110738	Ventura	Ritchen (Emilie) Elementary	1999,2000	418	489	907
6112841	Santa Cruz	Lakeview Middle	1997,1998,1999	534	186	720
6114029	Ventura	Brekke (Norman R.) Elementary	1999,2000	694	25	720
		Approximate total affected population		13,793	4,998	18,791

Note: Schools displayed in bold text were named in the Title VI complaint.

Appendix D: Disparity Analysis Summary Tables

List of Tables

Table 16: Disparity estimates for US EPA intermediate-term benchmark

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 35 ppb in 7 days	1995	0	0	2,091,418	3,313,019	0.000000	0.000000			0.387	
> 35 ppb in 7 days	1996	0	0	2,149,864	3,342,330	0.000000	0.000000			0.391	
> 35 ppb in 7 days	1997	0	0	2,257,349	3,381,380	0.000000	0.000000			0.400	
> 35 ppb in 7 days	1998	0	0	2,349,135	3,402,964	0.000000	0.000000			0.408	
> 35 ppb in 7 days	1999	1,627	855	2,445,418	3,425,319	0.000665	0.000249	2.67	0.656	0.417	1.57
> 35 ppb in 7 days	2000	1,048	187	2,527,666	3,395,192	0.000415	0.000055	7.52	0.848	0.427	1.99
> 35 ppb in 7 days	2001	1,441	903	2,610,334	3,354,702	0.000552	0.000269	2.05	0.615	0.438	1.40
> 35 ppb in 7 days	Avg							4.08			1.66
> 35 ppb in 7 days	Agg	3,396	1,567	3,924,345	5,111,641	0.000865	0.000306	2.82	0.684	0.434	1.58

Table 17: Disparity estimates for US EPA long-term benchmarks

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 1.3 ppb in 182 days	1995	45,555	17,575	2,045,863	3,295,444	0.021782	0.005305	4.11	0.722	0.383	1.88
> 1.3 ppb in 182 days	1996	49,728	21,131	2,100,136	3,321,200	0.023131	0.006322	3.66	0.702	0.387	1.81
> 1.3 ppb in 182 days	1997	54,207	24,460	2,203,142	3,356,920	0.024014	0.007234	3.32	0.689	0.396	1.74
> 1.3 ppb in 182 days	1998	59,471	29,696	2,289,664	3,373,268	0.025316	0.008727	2.90	0.667	0.404	1.65
> 1.3 ppb in 182 days	1999	65,723	32,096	2,381,322	3,394,078	0.026858	0.009368	2.87	0.672	0.412	1.63
> 1.3 ppb in 182 days	2000	61,487	27,567	2,467,227	3,367,813	0.024316	0.008119	2.99	0.690	0.423	1.63
> 1.3 ppb in 182 days	2001	52,301	23,630	2,559,474	3,331,976	0.020025	0.007042	2.84	0.689	0.434	1.59
> 1.3 ppb in 182 days	Avg							3.24			1.70
> 1.3 ppb in 182 days	Agg	166,315	78,963	6,014,390	8,395,067	0.026909	0.009318	2.89	0.678	0.417	1.62
> 1.3 ppb in 365 days	1995	15,286	3,527	2,076,132	3,309,492	0.007309	0.001065	6.87	0.813	0.385	2.11
> 1.3 ppb in 365 days	1996	21,045	7,568	2,128,819	3,334,762	0.009789	0.002264	4.32	0.736	0.390	1.89
> 1.3 ppb in 365 days	1997	22,017	9,276	2,235,332	3,372,104	0.009753	0.002743	3.56	0.704	0.399	1.76
> 1.3 ppb in 365 days	1998	22,458	8,977	2,326,677	3,393,987	0.009560	0.002638	3.62	0.714	0.407	1.76
> 1.3 ppb in 365 days	1999	42,838	13,609	2,404,207	3,412,565	0.017506	0.003972	4.41	0.759	0.413	1.84
> 1.3 ppb in 365 days	2000	33,139	14,396	2,495,575	3,380,983	0.013105	0.004240	3.09	0.697	0.425	1.64
> 1.3 ppb in 365 days	2001	22,029	11,939	2,589,746	3,343,666	0.008435	0.003558	2.37	0.649	0.436	1.49
> 1.3 ppb in 365 days	Avg							4.03			1.78
> 1.3 ppb in 365 days	Agg	91,199	35,598	6,089,507	8,438,432	0.014755	0.004201	3.51	0.719	0.419	1.72
> 1.3 ppb 2x in 182 days in same year	1995	12,504	2,797	2,078,914	3,310,222	0.005979	0.000844	7.08	0.817	0.386	2.12

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 1.3 ppb 2x in 182 days in same year	1996	11,927	3,654	2,137,937	3,338,677	0.005548	0.001093	5.08	0.766	0.390	1.96
> 1.3 ppb 2x in 182 days in same year	1997	8,994	3,661	2,248,355	3,377,719	0.003984	0.001083	3.68	0.711	0.400	1.78
> 1.3 ppb 2x in 182 days in same year	1998	15,461	5,653	2,333,674	3,397,311	0.006582	0.001661	3.96	0.732	0.407	1.80
> 1.3 ppb 2x in 182 days in same year	1999	35,391	10,344	2,411,654	3,415,830	0.014463	0.003019	4.79	0.774	0.414	1.87
> 1.3 ppb 2x in 182 days in same year	2000	20,432	10,980	2,508,282	3,384,400	0.008080	0.003234	2.50	0.650	0.426	1.53
> 1.3 ppb 2x in 182 days in same year	2001	3,258	1,783	2,608,517	3,353,822	0.001247	0.000531	2.35	0.646	0.437	1.48
> 1.3 ppb 2x in 182 days in same year	Avg							4.21			1.79
> 1.3 ppb 2x in 182 days in same year	Agg	63,858	23,560	6,116,847	8,450,470	0.010332	0.002780	3.72	0.730	0.420	1.74
> 1.3 ppb 6x in 30 days in same year	1995	1,613	553	2,089,805	3,312,466	0.000771	0.000167	4.62	0.745	0.387	1.93
> 1.3 ppb 6x in 30 days in same year	1996	197	321	2,149,667	3,342,009	0.000092	0.000096	0.96	0.381	0.391	0.97
> 1.3 ppb 6x in 30 days in same year	1997	1,735	1,082	2,255,614	3,380,298	0.000769	0.000320	2.40	0.616	0.400	1.54
> 1.3 ppb 6x in 30 days in same year	1998	0	0	2,349,135	3,402,964	0.000000	0.000000			0.408	
> 1.3 ppb 6x in 30 days in same year	1999	5,551	3,329	2,441,494	3,422,844	0.002268	0.000972	2.33	0.625	0.416	1.50
> 1.3 ppb 6x in 30 days in same year	2000	9,424	3,805	2,519,291	3,391,574	0.003727	0.001121	3.33	0.712	0.426	1.67
> 1.3 ppb 6x in 30 days in same year	2001	582	41	2,611,193	3,355,564	0.000223	0.000012	18.17	0.934	0.438	2.13

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 1.3 ppb 6x in 30 days in same year	Avg							5.30			1.62
> 1.3 ppb 6x in 30 days in same year	Agg	16,890	7,751	6,085,766	8,397,586	0.002768	0.000922	3.00	0.685	0.420	1.63
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	1996	1,132	122	1,585,410	2,518,393	0.000713	0.000048	14.74	0.903	0.386	2.34
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	1997	2,819	779	1,591,663	2,503,096	0.001768	0.000311	5.69	0.784	0.389	2.02
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	1998	1,568	752	1,671,255	2,520,765	0.000937	0.000298	3.14	0.676	0.399	1.70
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	1999	1,707	990	1,739,248	2,533,975	0.000980	0.000390	2.51	0.633	0.407	1.56
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	2000	9,440	3,594	1,793,293	2,541,753	0.005237	0.001412	3.71	0.724	0.414	1.75
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	2001	1,986	997	1,855,075	2,517,606	0.001069	0.000396	2.70	0.666	0.424	1.57
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	Avg							5.41			1.82
> 2.6 ppb & >1.3 ppb in 182 days in same year for 2 yrs in a row	Agg	13,794	4,998	4,525,831	6,516,155	0.003039	0.000766	3.96	0.734	0.410	1.79

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 2.6 ppb 2x in 182 days in same year	1995	0	0	2,091,418	3,313,019	0.000000	0.000000			0.387	
> 2.6 ppb 2x in 182 days in same year	1996	1,524	792	2,148,340	3,341,538	0.000709	0.000237	2.99	0.658	0.391	1.68
> 2.6 ppb 2x in 182 days in same year	1997	0	0	2,257,349	3,381,380	0.000000	0.000000			0.400	
> 2.6 ppb 2x in 182 days in same year	1998	1,623	857	2,347,512	3,402,107	0.000691	0.000252	2.74	0.654	0.408	1.60
> 2.6 ppb 2x in 182 days in same year	1999	3,689	2,353	2,443,356	3,423,821	0.001508	0.000687	2.20	0.611	0.416	1.47
> 2.6 ppb 2x in 182 days in same year	2000	4,797	1,614	2,523,917	3,393,765	0.001897	0.000475	3.99	0.748	0.427	1.75
> 2.6 ppb 2x in 182 days in same year	2001	0	0	2,611,775	3,355,606	0.000000	0.000000			0.438	
> 2.6 ppb 2x in 182 days in same year	Avg							2.98			1.63
> 2.6 ppb 2x in 182 days in same year	Agg	8,467	3,953	4,834,064	6,770,364	0.001748	0.000584	3.00	0.682	0.417	1.64

Table 18: Disparity estimates for Cal/EPA intermediate-term benchmarks

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 9 ppb in 42 days	1995	2,236	338	2,089,182	3,312,681	0.001069	0.000102	10.48	0.869	0.387	2.25
> 9 ppb in 42 days	1996	3,664	1,243	2,146,200	3,341,087	0.001704	0.000372	4.58	0.747	0.391	1.91
> 9 ppb in 42 days	1997	2,813	1,228	2,254,536	3,380,152	0.001246	0.000363	3.43	0.696	0.400	1.74
> 9 ppb in 42 days	1998	5,757	1,994	2,343,378	3,400,970	0.002451	0.000586	4.18	0.743	0.408	1.82
> 9 ppb in 42 days	1999	15,530	4,414	2,431,515	3,421,759	0.006346	0.001288	4.93	0.779	0.415	1.87
> 9 ppb in 42 days	2000	10,944	4,415	2,517,771	3,390,964	0.004328	0.001300	3.33	0.713	0.426	1.67
> 9 ppb in 42 days	2001	15,131	10,364	2,596,644	3,345,242	0.005793	0.003089	1.88	0.593	0.437	1.36
> 9 ppb in 42 days	Avg							4.69			1.80
> 9 ppb in 42 days	Agg	36,873	16,335	6,143,832	8,457,695	0.005966	0.001928	3.09	0.693	0.421	1.65
> 9 ppb in 30 days	1995	4,821	759	2,086,597	3,312,260	0.002305	0.000229	10.06	0.864	0.386	2.24
> 9 ppb in 30 days	1996	14,028	4,478	2,135,837	3,337,852	0.006525	0.00134	4.87	0.758	0.390	1.94
> 9 ppb in 30 days	1997	11,005	2,961	2,246,344	3,378,418	0.004875	0.000876	5.57	0.788	0.399	1.97
> 9 ppb in 30 days	1998	13,641	5,220	2,335,494	3,397,744	0.005807	0.001534	3.79	0.723	0.407	1.78
> 9 ppb in 30 days	1999	28,488	7,953	2,418,557	3,418,220	0.011642	0.002321	5.02	0.782	0.414	1.89
> 9 ppb in 30 days	2000	16,403	7,344	2,512,311	3,388,035	0.006487	0.002163	3.00	0.691	0.426	1.62
> 9 ppb in 30 days	2001	19,186	11,340	2,592,590	3,344,266	0.007346	0.003379	2.17	0.629	0.437	1.44
> 9 ppb in 30 days	Avg							4.92			1.84
> 9 ppb in 30 days	Agg	62,892	24,731	6,117,813	8,449,299	0.010176	0.002918	3.49	0.718	0.420	1.71
> 5 ppb in 30 days	1995	27,553	10,086	2,063,865	3,302,933	0.013174	0.003044	4.33	0.732	0.385	1.90
> 5 ppb in 30 days	1996	34,665	16,907	2,115,199	3,325,423	0.016124	0.005058	3.19	0.672	0.389	1.73
> 5 ppb in 30 days	1997	35,921	18,292	2,221,428	3,363,088	0.015913	0.00541	2.94	0.663	0.398	1.67
> 5 ppb in 30 days	1998	40,900	27,043	2,308,235	3,375,920	0.017411	0.007947	2.19	0.602	0.406	1.48

Criterion	Year	Affected		Non-Affected		pr1 = Prob (affect| Hisp)	pr2 = Prob (affect| Non-Hisp)	Threshold Risk Ratio pr1/pr2	pr3 = Prob (Hisp| affect)	pr4 = Prob (Hisp| non-affect)	Demog Ratio pr3/pr4
		Hisp	Non-Hisp	Hisp	Non-Hisp						
> 5 ppb in 30 days	1999	53,311	25,611	2,393,734	3,400,563	0.021786	0.007475	2.91	0.675	0.413	1.64
> 5 ppb in 30 days	2000	45,177	19,616	2,483,538	3,375,764	0.017866	0.005777	3.09	0.697	0.424	1.65
> 5 ppb in 30 days	2001	42,044	19,502	2,569,731	3,336,104	0.016098	0.005812	2.77	0.683	0.435	1.57
> 5 ppb in 30 days	Avg							3.06			1.66
> 5 ppb in 30 days	Agg	132,518	67,600	6,048,187	8,406,430	0.021441	0.007977	2.69	0.662	0.418	1.58
> 1 ppb in 42 days	1995	155,080	165,184	1,936,338	3,147,835	0.074151	0.049859	1.49	0.484	0.381	1.27
> 1 ppb in 42 days	1996	123,857	137,235	2,026,008	3,205,095	0.057611	0.041060	1.40	0.474	0.387	1.22
> 1 ppb in 42 days	1997	150,108	146,478	2,107,241	3,234,902	0.066497	0.043319	1.54	0.506	0.394	1.28
> 1 ppb in 42 days	1998	125,769	111,075	2,223,366	3,291,889	0.053538	0.032641	1.64	0.531	0.403	1.32
> 1 ppb in 42 days	1999	141,778	116,940	2,305,267	3,309,233	0.057939	0.034132	1.70	0.548	0.411	1.33
> 1 ppb in 42 days	2000	106,605	69,721	2,422,110	3,325,658	0.042158	0.020534	2.05	0.605	0.421	1.43
> 1 ppb in 42 days	2001	100,453	60,181	2,511,322	3,295,425	0.038462	0.017934	2.14	0.625	0.432	1.45
> 1 ppb in 42 days	Avg							1.71			1.33
> 1 ppb in 42 days	Agg	430,542	396,900	5,750,163	8,077,130	0.069659	0.046837	1.49	0.520	0.416	1.25
> 1 ppb in 30 days	1995	194,663	220,762	1,896,755	3,092,257	0.093077	0.066635	1.40	0.469	0.380	1.23
> 1 ppb in 30 days	1996	144,602	177,222	2,005,262	3,165,108	0.067261	0.053024	1.27	0.449	0.388	1.16
> 1 ppb in 30 days	1997	175,417	182,640	2,081,932	3,198,739	0.077709	0.054014	1.44	0.490	0.394	1.24
> 1 ppb in 30 days	1998	149,569	149,211	2,199,566	3,253,753	0.06367	0.043847	1.45	0.501	0.403	1.24
> 1 ppb in 30 days	1999	164,012	146,898	2,283,033	3,279,275	0.067024	0.042875	1.56	0.528	0.410	1.29
> 1 ppb in 30 days	2000	120,419	80,015	2,408,295	3,315,365	0.047621	0.023566	2.02	0.601	0.421	1.43
> 1 ppb in 30 days	2001	107,422	67,175	2,504,353	3,288,430	0.04113	0.020019	2.05	0.615	0.432	1.42
> 1 ppb in 30 days	Avg							1.60			1.29
> 1 ppb in 30 days	Agg	524,559	513,745	5,656,146	7,960,285	0.08487	0.060626	1.40	0.505	0.415	1.22

Appendix E: Summary of Alternative Approach to Characterizing the Comparison Population for Disparity Analysis

The following table summarizes school system enrollments and demographics by school year for 8451 California public schools. This was the universe of schools examined in the complaint investigation, with the inventory and student composition derived from data from the California Department of Education.

The percentage of Latino students in the populations presented in this table is conceptually very similar to the percentage of Latino students used in computing disparity analysis results in the complaint investigation. A portion of the disparity analysis included the fraction of non-affected Latino students as the denominator in the "demographic ratio" presented in tables in Appendix F of the exposure and disparity analysis report (listed as pr4). The demographic ratio calculation is computed as the proportion of Latino students in the affected population (with schools estimated to have exceedances of MeBr target thresholds), divided by the proportion of Latino students in the non-affected population. Because the fraction of the population considered affected is relatively small, the non-affected population closely approximates the total school population, both in size and demographic characteristics.

The table presents demographic characteristics both for the entire population of California schools, as well as for the subset of schools in proximity to farmland. Using the analysis approach described in Appendix C of the exposure and disparity report (and summarized here as table footnote 1), the number of schools proximate to farmland was estimated to be 84%. The size and Latino composition of students at these schools was similar to that for all schools, and was approximately 83% and 95%, respectively.

In calculating the demographic ratio, as the proportion of Latino students in the pr4 value goes up, the size of the ratio goes down, and vice-versa. The percentage of Latino students in schools proximate to farmland generally was slightly less, so the size of the demographic ratio would increase slightly. An example calculation shows:

Pr3 = .65	/	Pr4 = .40
(the probability of a member of the affected population being Latino)		(the probability of a member of the non-affected population being Latino)

yields a demographic ratio value of 1.625. If the value of pr4 is .38 instead, the resulting demographic ratio value would be .65/.38 = 1.71.

	All Schools			Schools Proximate to Farmland[1]		
School Year	Total Students	Latino Students[2,3]	Latino Percentage	Total Students	Latino Students[2,3]	Latino Percentage
1995-1996	5,410,775	2,095,274	39%	4,475,445	1,636,381	37%
1996-1997	5,557,471	2,206,340	40%	4,601,634	1,728,607	38%
1997-1998	5,672,995	2,297,001	40%	4,698,530	1,803,124	38%
1998-1999	5,793,018	2,395,659	41%	4,802,221	1,887,196	39%
1999-2000	5,907,718	2,501,271	42%	4,901,572	1,975,289	40%
2000-2001	5,955,734	2,587,166	43%	4,946,561	2,047,826	41%
2001-2002	5,992,758	2,671,195	45%	4,979,064	2,120,757	43%

Table Notes:

[1] The following were the distances of influence estimated for various-sized fields based on an air dispersion modeling analysis (See Carr et al. *Angelita C: ISC modeling for proximity analysis*. Memorandum to Loren Hall, US EPA Office of Civil Rights. July 26, 2004)

- Less than 10 acres 1 mile
- 10 – 20 acres 2 miles
- 20-40 acres 3 miles
- Greater than 40 acres 5 miles

[2]Starting in the 1998-1999 school year, CDE added a demographic designation "multiple or no response". For this analysis, students so designated were allocated to the Latino category in proportion to the Latino fraction of students with an identified demographic category for that school and school year.

[3]For 8 schools no demographic data were provided by CDE for one or more school years. In those cases the Latino fraction was estimated from the fraction at that school in other school years for which demographic data were provided.