



Public Workshop: AB 1900 Proposed Biomethane Monitoring Recommendations

*CARB Supplement Report to OEHHA AB 1900 Biogas
Recommendations*

October 18, 2022

Workshop Information

- Questions/comments will be addressed at the end of the presentation (instructions to follow)
- Written comments may be submitted through November 8th (5 pm)
<https://ww2.arb.ca.gov/our-work/programs/slcp/meetings>
- Due to ZOOM limitations, callers will not have the ability to ask questions/make comments

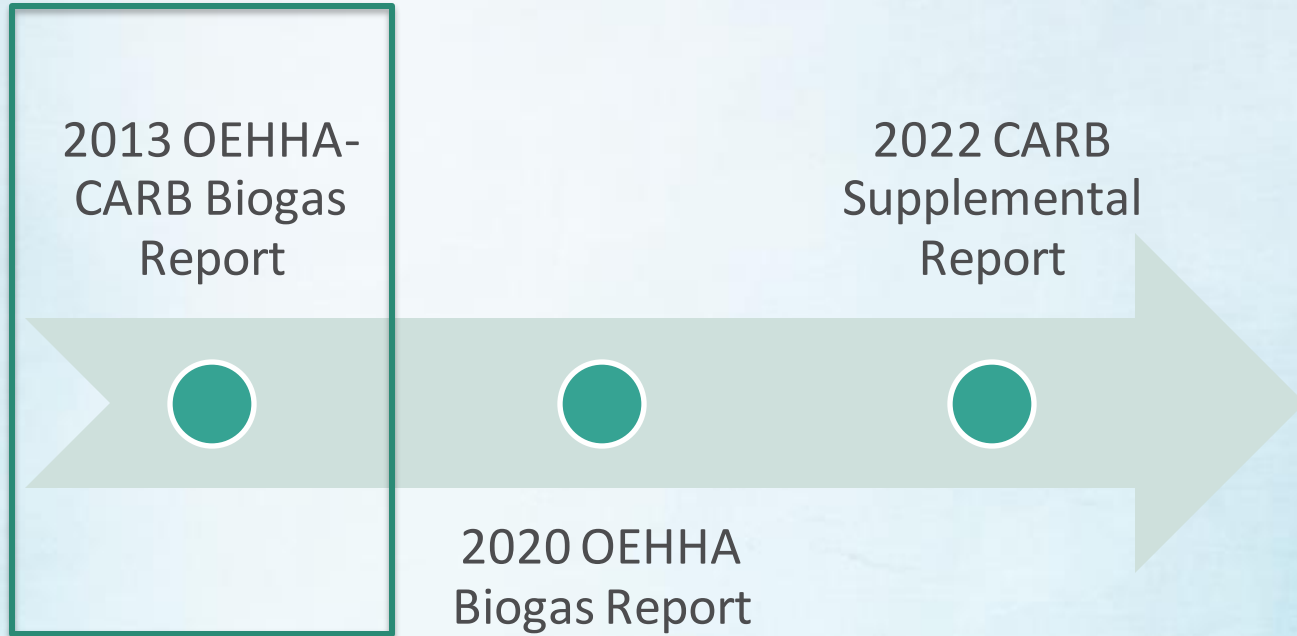
AB 1900 Background

- Assembly Bill 1900 (Gatto) September 27, 2012
- Establishes a process to promote and facilitate injection of biomethane into carrier pipelines
 - **Biogas:** gas produced from anaerobic decomposition of organic material
 - **Biomethane:** biogas that meets the standards for injection into a common carrier pipeline

AB 1900 Background

- Office of Environmental Health Hazard Assessment (OEHHA) identifies constituents of concern (COCs) in biogas and recommends health protective levels
- CARB identifies realistic exposure scenarios, associated health risks, and monitoring requirements for COCs
- California Public Utilities Commission (CPUC) adopts recommendations proposed by CARB to protect human health and pipeline integrity and safety

AB 1900 Background

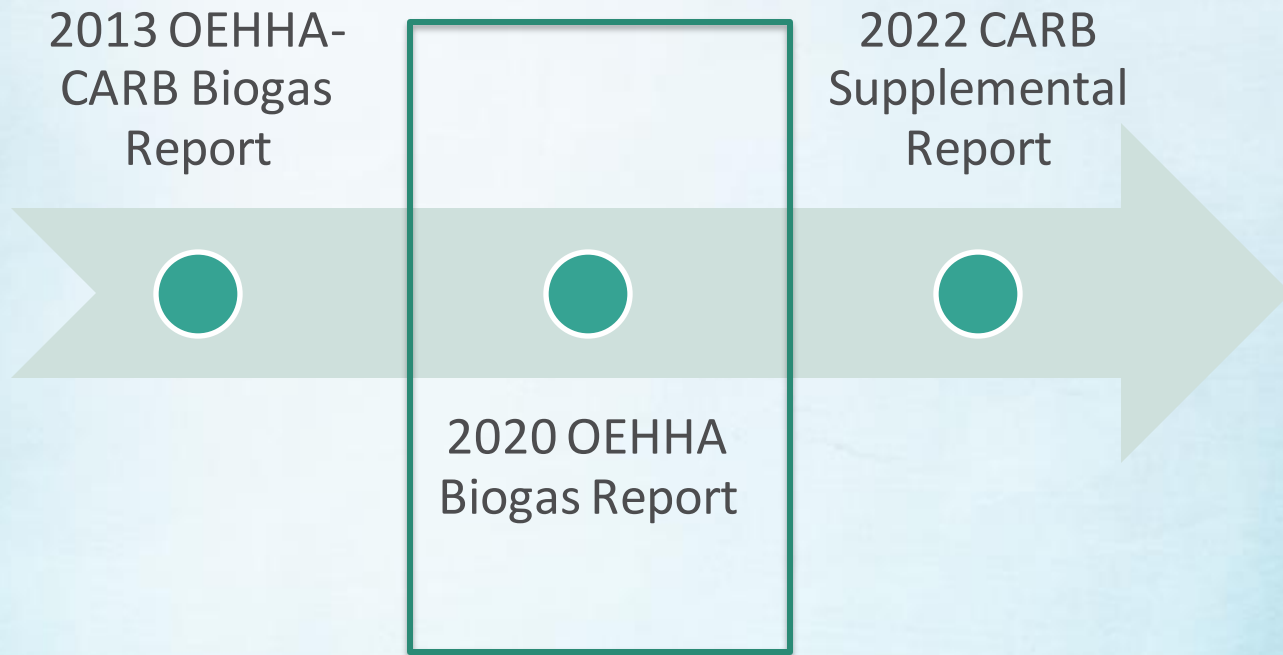


2013 OEHHA-CARB Biogas Report

- Calculated health-protective levels for 12 COCs identified in raw and upgraded biogas
- Developed realistic exposure scenarios: 2 residential (household leak, pre-ignition phase of stove use), 2 worker (biogas worksite leak, service call)
- Determined health-protective levels based on cancer and non-cancer risk thresholds
- Established recommended test methods for each identified COC

Constituent of Concern
1,4-Dichlorobenzene
Alkyl Thiols (ppm)
Antimony
Arsenic
Copper
Ethylbenzene
Hydrogen Sulfide
Lead
Methacrolein
N-nitroso-di-n-propylamine
Toluene
Vinyl Chloride

AB 1900 Background



AB 1900 Background

2013 Report

- 12 COCs identified from raw and upgraded biogas
- Exposure scenarios
 - Residential: household leak, pre-ignition phase of stove use
 - Worker: biogas worksite leak, service call
- Health-protective levels calculated with 2013 toxicology data

2020 Report

- **15** COCs identified from raw and upgraded biogas
- Exposure scenarios
 - Residential: household leak, **stovetop combustion**
 - Worker: biogas worksite leak
- Health-protective levels calculated with **updated** toxicology data

Constituents of Concern

2013 COCs
1,4-Dichlorobenzene
Alkyl Thiols
Antimony
Arsenic
Copper
Ethylbenzene
Hydrogen Sulfide
Lead
N-nitroso-di-n-propylamine
Methacrolein
Toluene
Vinyl Chloride

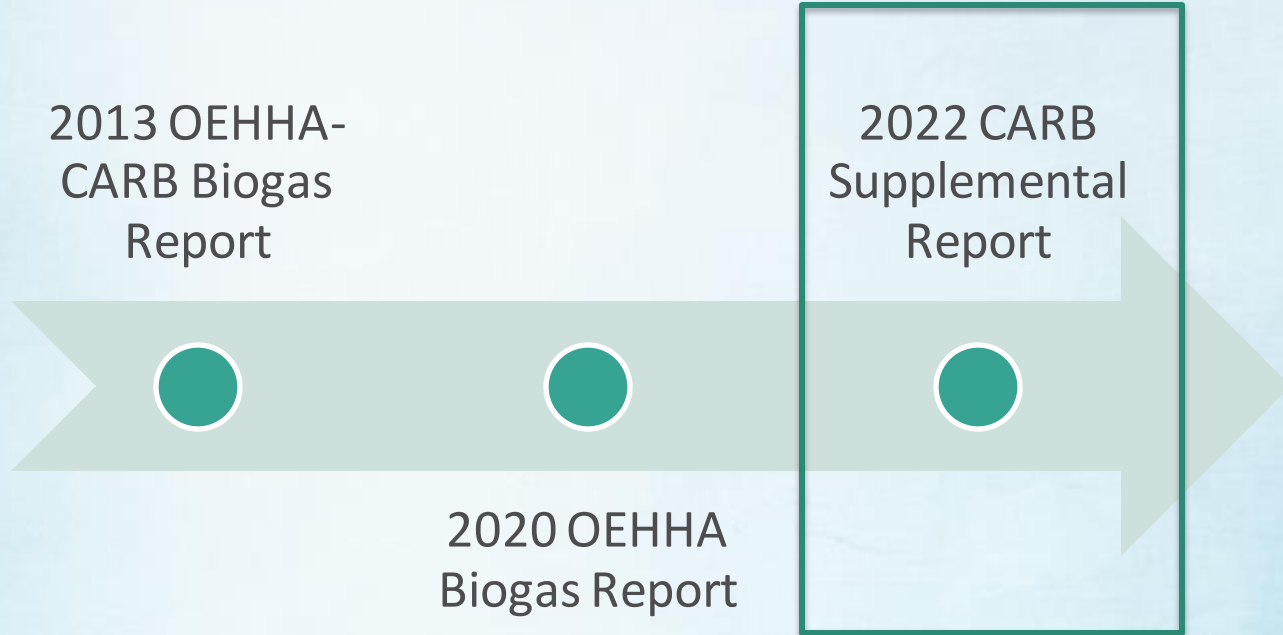
Deleted COCs bolded/highlighted in blue



2020 COCs
1,4-Dichlorobenzene
Alkyl Thiols
Antimony
Arsenic
Cadmium
Chlorocarbons (Cl)
Chromium (2% Cr VI)
Ethylbenzene
Fluorocarbons (F)
Hydrogen Sulfide
Lead
N-nitroso-di-n-propylamine
Silicon compounds (Si)
Sulfur compounds (S)
Vinyl Chloride

New COCs bolded/highlighted in yellow

AB 1900 Background



Proposed CARB 2022 Recommendations

to supplement OEHHA's 2020 Biogas Report

- Updated sources of COCs
- COC risk management level concentrations
- Updated recommended test methods
- Reporting and recordkeeping requirements
- Realistic exposure scenarios

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New sources of COCs

- New source categories for biomethane
 - Other: Ensures minimum testing requirements for biomethane where sources vary and/or COC composition is unknown
 - Food/Green Waste: Ensures testing requirements for current sources
 - **Food waste** is waste derived from plants, animals, or micro-organisms with the explicit intent of being consumed as food for humans or animals. This includes any biodegradable organic material that is typically mixed in with food waste, including but not limited to: food-soiled paper or cardboard, food wrappers, egg cartons and the like
 - **Green waste** is any biodegradable organic material resulting from yard, landscaping, forestry or agricultural activities, including but not limited to: leaves, grass, shrubs, plants, branches, stumps and the like

New sources of COCs

Updated Monitoring Requirements

- Evaluated additional/new studies to update COCs found in different biogas streams
- Considered commercial lab detection limits when evaluating partially-upgraded biogas and biomethane
 - Landfills
 - Added chromium & 4 chemical classes (chlorocarbons, fluorocarbons, silicon compounds, sulfur compounds)²
 - Removed N-nitroso-di-n-propylamine^{1,2}

¹Evaluation and Identification of Constituents Found in Common Carrier Pipeline Natural Gas, Biogas and Upgraded Biomethane in California. 2017. <https://ww2.arb.ca.gov/sites/default/files/2020-11/AB1900PhaseIReport.pdf>

²Evaluation and Identification of Constituents in Pipeline Natural Gas, Biogas, and Biomethane in California: Wastewater Treatment, Green Waste, and Landfills. 2020. <https://www.energy.ca.gov/sites/default/files/2021-05/CEC-500-2020-031.pdf>

New sources of COCs

Updated Monitoring Requirements Cont.

- Considered commercial lab detection limits when evaluating partially-upgraded biogas and biomethane
 - Dairies
 - Added 1,4-dichlorobenzene, cadmium, vinyl chloride & 3 chemical classes (chlorocarbons, silicon compounds, sulfur compounds)¹
 - Sewage Treatment
 - Added cadmium, chromium, lead & 3 chemical classes (chlorocarbons, silicon compounds, sulfur compounds)²

¹Evaluation and Identification of Constituents Found in Common Carrier Pipeline Natural Gas, Biogas and Upgraded Biomethane in California. 2017. <https://ww2.arb.ca.gov/sites/default/files/2020-11/AB1900PhaseIReport.pdf>

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Proposed Testing by Biogas Source

Constituents of Concern	Landfills	Dairies	Sewage Treatment	Food/ Green	Other
1,4-Dichlorobenzene	X	<u>X</u>	X	<u>X</u>	<u>X</u>
Alkyl Thiols (mercaptans)	X	X	X	<u>X</u>	<u>X</u>
Antimony	X				<u>X</u>
Arsenic	X				<u>X</u>
Cadmium*		<u>X</u>	<u>X</u>		<u>X</u>
Chlorocarbons (as Cl)*	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
Chromium (2% Cr VI)*	<u>X</u>		<u>X</u>		<u>X</u>
Ethylbenzene	X	X	X	<u>X</u>	<u>X</u>
Fluorocarbons (as F)*	<u>X</u>			<u>X</u>	<u>X</u>
Hydrogen Sulfide	X	X	X	<u>X</u>	<u>X</u>
Lead	X		<u>X</u>		<u>X</u>
N-nitroso-di-n-propylamine		X			<u>X</u>
Silicon Compounds (as Si)*	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
Sulfur Compounds (as S)*	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>
Vinyl Chloride	X	<u>X</u>	X	<u>X</u>	<u>X</u>

Proposed CARB 2022 Recommendations to supplement OEHHA's 2020 Biogas Report

- New sources of COCs
- COC risk management level concentrations
- Update recommended test methods
- Reporting and recordkeeping requirements
- Realistic exposure scenarios

COC Risk Management Level Concentrations

- Updated recommended risk management threshold concentrations for the 15 constituents/chemical groups
 - Trigger Level
 - Lower Action Level
 - Upper Action Level
- Used OEHHA's updated hazard quotients or cancer risk
- Considered limitations on commercially attainable detection limits

COC Risk Management Level Concentrations

- Adjustments to Risk Management Levels
 - Evaluated commercial laboratory detection limits
 - Detection limits not low enough to meet trigger level concentrations of arsenic, cadmium, chromium, and N-nitroso-di-n-propylamine
 - Sulfur compounds and alkyl thiol risk management levels are calculated based on acute exposure scenarios

Recommended Risk Management Levels

Constituent of Concern (mg/m3) or (ppm)	Trigger Level	Cancer Risk Lower Level	Cancer Risk Upper Level	Non-Cancer Risk Lower Level	Non-Cancer Risk Upper Level
1,4-Dichlorobenzene	4.2	42	100	N/A	N/A
Alkyl Thiols (ppm)	17 (ppm)	N/A	N/A	170	860
Antimony	0.062	N/A	N/A	0.62	3.1
Arsenic	<u>0.0020</u> ^(b)	0.0040	0.010	N/A	N/A
Cadmium*	<u>0.0020</u> ^(b)	0.0032	0.0080	N/A	N/A
Chlorocarbons (as Cl)*	5.0	N/A	N/A	50	250
Chromium (2% Cr VI)*	<u>0.0020</u> ^(b)	0.0048	0.012	N/A	N/A
Ethylbenzene	19	190	490	N/A	N/A
Fluorocarbons (as F)*	7.8	N/A	N/A	78	390
Hydrogen Sulfide ^(a)	63	N/A	N/A	860	4,300
Lead	0.047	N/A	N/A	0.47	2.3
N-nitroso-di-n-propylamine	<u>0.028</u> ^(b)	0.24	0.61	N/A	N/A
Silicon Compounds (as Si)*	1.0	N/A	N/A	10	52
Sulfur Compounds (as S)*	25	N/A	N/A	250	1,200
Vinyl Chloride	0.63	6.3	15	N/A	N/A

(a) The HPL concentration for hydrogen sulfide is based on the chronic worker-exposure scenario as displayed in Table I-1 of the 2020 OEHHA update (86.8 mg/m3).

(b) The recommended value was set to the lowest detectable concentration. As technology improves this value will decrease until it reaches the OEHHA 2020 health protective level

*New COCs; Adjusted Trigger Levels underlined

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Updated Recommended Test Methods

- Included test methods for newly added constituents
- Evaluated methods for N-nitroso-di-n-propylamine, sulfur compounds (organic), and fluorinated compounds (organic),
- Silicon compounds (organic) ASTM D8230 currently being updated

Recommended Test Methods for COCs

Constituent of Concern	Test Method
Metals	
Lead, Antimony, Arsenic, Cadmium*, Chromium*	EPA Method 29 (AAS/ICP/ICP-MS)
Nitroso Compounds	
N-Nitroso-di-n-Propylamine	EPA Method 8270 (GC/MS), <u>EPA Method TO-13 (GC/MS)</u> , <u>NIOSH Method 5528 (GC/MS)</u>
Sulfur Compounds	
Hydrogen Sulfide	ASTM D4084, D7165, D7493, ASTM D5504, D6228 (lab), <u>D6968</u>
Sulfur Compounds*	ASTM D5504, D6228 (lab), <u>D6968</u>
Alkyl Thiols	ASTM D7165, D7493, D5504, D6228, <u>D6968</u>
SVOCs, VOCs, and Alkyl Benzenes	
p-Dichlorobenzene, Vinyl Chloride, Ethylbenzene	EPA Method TO-15, <u>TO-14</u> (GC/MS)
Chlorocarbons*	EPA Method TO-15, TO-14 (GC/MS)
Silicon compounds*	ASTM D8230-19 ^(a)
Fluorinated Compounds	
Fluorocarbons*	EPA Method TO-15, TO-14 ^(b)

Monitoring Requirements for COCs

Monitoring Result	Action
Result < Trigger Level	Annual monitoring
Result < Trigger Level for 2 consecutive years	Monitor every 2 years
Trigger Level ≤ Result < Lower Action Level	Quarterly monitoring until Result < Trigger Level
Lower Action Level ≤ Result < Upper Action Level	Quarterly monitoring
Lower Action Level ≤ Result < Upper Action Level 3 results in 1 year (12 months)	Shut off, resolve issue, and retest
Upper Action Level ≤ Result	Shut off, resolve issue, and retest

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Reporting and Recordkeeping Requirements

- CARB staff recommends the CPUC maintain current reporting and recordkeeping requirements

Realistic Exposure Scenarios

- In 2020, OEHHA added a stove-combustion scenario
- CARB staff did not consider any additional scenarios in this report
- Exposure to biogas flaring, and/or fugitive emissions from biogas facilities may be included in future assessments

Next Steps

- Comment docket open through Tuesday, November 8th (5 pm), all comments will be considered
- Final report expected to be published Q1 2023
 - No later than 6mo after final report publication date, IOUs must file an application with CPUC to enact biomethane standard changes into the renewable gas tariff
 - CPUC is obligated to adopt a decision in response to the application no later than the end of 2023

Questions/Comments

- Please raise your hand to ask a question/comment
 - See the "reactions" button at the bottom of the screen
 - Select the "raise hand" button
- When called on
 - Please introduce yourself and ask your questions/make your comments



Thank You

Please submit written comments/questions before
5 pm November 8th

<https://ww2.arb.ca.gov/our-work/programs/slcp/meetings>