

2009 Priority Setting Workshop

**Proceedings of a Workshop Hosted by
The Clean Air Strategic Alliance**

For Alberta Environment

March 2010

Acknowledgements

Alberta Environment provided the funding for this workshop, the results of which will be used to guide the process for developing ambient air quality objectives for priority substances.

The Priority Setting Workshop Organizing Committee was responsible for arranging the workshop, and acknowledges the support of all participants who shared their time and expertise.

About CASA

The Clean Air Strategic Alliance (CASA) is a non-profit association composed of stakeholders from three sectors – government, industry and non-government organizations such as health and environmental groups. All CASA groups and teams, including the board of directors, make decisions and recommendations by consensus. These recommendations are likely to be more innovative and longer lasting than those reached through traditional negotiation processes. CASA's vision is that the air will have no adverse odour, taste, or visual impact and have no measurable short- or long-term adverse effects on people, animals or the environment.

Clean Air Strategic Alliance
10035 108 St NW Flr 10
Edmonton AB T5J 3E1

Ph (780) 427-9793

Fax (780) 422-3127

E-mail: casa@casahome.org

Web: <http://www.casahome.org>

© 2010 Clean Air Strategic Alliance

TABLE OF CONTENTS

LIST OF TABLES.....	i
ACRONYMS AND ABBREVIATIONS.....	ii
SUMMARY	1
1.0 INTRODUCTION	2
1.1 Background.....	2
2.0 IDENTIFICATION OF PRIORITY SUBSTANCES.....	4
2.1 Breakout Group Work.....	4
2.2 Priority List of Substances.....	4
APPENDIX A WORKSHOP PARTICIPANTS	6
APPENDIX B SUBSTANCES NOMINATED BY THE PUBLIC	9
APPENDIX C SUBSTANCES PRIORITIZED BY BREAKOUT GROUPS	11
Breakout Group 1	12
Breakout Group 2	16
Breakout Group 3	19

LIST OF TABLES

Table 1	Priority Substances Identified by Breakout Groups.....	4
---------	--------------------------------------------------------	---

ACRONYMS AND ABBREVIATIONS

(A)AQO	(Ambient) Air Quality Objective
AENV	Alberta Environment
B(a)P	Benzo(a)Pyrene
CASA	Clean Air Strategic Alliance
CCME	Canadian Council of Ministers of the Environment
CWS	Canada Wide Standard(s)
EPEA	Environmental Protection and Enhancement Act
GoA	Government of Alberta
H ₂ S	Hydrogen sulphide
kg	kilogram
mg	milligram
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPRI	National Pollutant Release Inventory
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate matter. PM _x refers to the diameter of these particles, with PM _{2.5} having a diameter of 2.5 microns, PM ₁₀ a diameter of 10 microns, and PM _{0.2} a diameter of 0.02 microns. These are referred to respectively as fine PM, coarse PM and ultrafine PM.
SO ₂	Sulphur dioxide
TRACI	Tool for the Reduction and Assessment of Chemical and Other Environmental Factors
TSP	Total Suspended Particulates
US EPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

SUMMARY

Ambient air quality objectives are an important part of Alberta's air quality management system. Under section 14 of the *Environmental Protection and Enhancement Act*, Alberta Environment sets ambient air quality objectives for the province. When an objective is written into a facility approval, it becomes a legal requirement for that facility. The objectives are also very useful in airshed management and planning, and for communicating the state of air quality to the public.

This was the third priority-setting workshop held by Alberta Environment with the help of the Clean Air Strategic Alliance, to receive stakeholder input into the prioritization of substances for the objective setting process. These workshops produce a priority list of substances that becomes the focus of Alberta Environment's three-year work plan.

Prior to the workshop, the organizing committee assembled suggestions for priority substances, including those nominated by Albertans. All suggestions were reviewed and workshop participants further refined the lists. Consensus was reached on 11 priority substances:

- Mercury
- Ultrafine PM
- Para-cresol
- Radionuclides
- Acrolein
- Carbonyl sulphide
- Hydrogen sulphide
- Ammonia (ecological effects)
- Arsenic
- Cadmium
- Volatile Organic Compounds (Alberta Environment to choose one or two based on health effects and ozone forming potential)

A significant number of nominations involved odours, most of which related to agricultural operations. Workshop participants agreed that the odour issue is important. However, it is not within the scope of this workshop and will be handled outside the priority-setting process.

1.0 INTRODUCTION

Laura Blair and Bettina Mueller welcomed participantsⁱ to the third priority setting workshop organized by CASA for Alberta Environment.ⁱⁱ

Diana McQueen, parliamentary assistant to the Minister of Environment, thanked participants for attending the workshop and providing their input to this important process. She acknowledged the good advice that the Government of Alberta has received from CASA over the years on a variety of topics, most recently recommendations for a draft Clean Air Strategy. She acknowledged the commitment and dedication of the strong air quality team in Alberta Environment and noted that the province is also collaborating with various stakeholders, including the federal government to make a good system even better.

Kerra Chomlak, executive director of CASA, noted that 2009 is CASA's 15th anniversary. She briefly reviewed some of CASA's accomplishments, mentioning in particular the recent recommendations for a renewed Clean Air Strategy and a new Ambient Monitoring Strategic Plan. CASA's consensus process has been a big part of these successes and workshop participants were encouraged to speak openly and work to reach consensus on the list of substances to be forwarded to Alberta Environment.

1.1 Background

Laura Blair and Bettina Mueller provided background on the process used by Alberta Environment (AENV) to set ambient air quality objectives (AAQOs). AENV has AAQOs and guidelines for 51 substances.ⁱⁱⁱ The purpose of this workshop is to produce a list of 8-12 priority substances for AENV to consider in its next three-year work plan for developing or reviewing AAQOs.

Alberta Environment has authority to establish AAQOs under section 14(1) of the Alberta *Environmental Protection and Enhancement Act* (EPEA). AAQOs are used to:

- Set outcomes for regional and provincial management,
- Determine facility design,
- Assess compliance and evaluate facility performance, and
- Report on the state of the environment.

Three major factors are considered in setting AAQOs:

- Science (health effects, ecosystem effects)
- Achievability (can the AAQO be achieved with technology that is currently available?)
- Ability to monitor

AAQOs are often a compromise between science and achievability. They are not entirely protective of human health and/or the ecosystem and, importantly, they are not a safe level that can be polluted up to.

ⁱ See Appendix A for a list of participants at this workshop.

ⁱⁱ Previous workshops were held in 2000 and 2004.

ⁱⁱⁱ This information is available online at <http://environment.alberta.ca/1066.html>.

The recommended priority substances from this workshop will be transmitted to AENV to develop or review AAQOs. It was noted that objectives for three priority substances from the 2004 workshop are still under review: nitrogen dioxide (NO₂), sulphur dioxide (SO₂) and benzene.

The contents of the invitation package were reviewed, as the information could be used in the breakout groups; this included:

- Information on releases of substances to the air in Alberta obtained from the 2007 National Pollutant Release Inventory (NPRI),
- Substances from the 2004 Priority Setting Workshop,
- Information on substances nominated by the public for consideration at this workshop,^{iv} and
- Chemical fact sheets, which were provided on the CASA website prior to the workshop and as hard copy to each breakout group at the workshop.

Substances from the above lists were ranked for their relative impact in four categories: human health criteria, eutrophication, acidification and smog, using characterization factors from the Tool for the Reduction and Assessment of Chemical and Other Environmental Factors (TRACI), where factors were available. TRACI characterization factors were obtained from the US EPA.

Linda Jabs reviewed the ground rules and the goals for the session. The following points emerged as clarification in response to questions:

- AENV's multi-stakeholder advisory committee will continue to have a role in developing and revising AAQOs. The Committee aims to reach consensus, but if that is not possible, AENV will make the final decision.
- Many of the substances submitted for consideration at this workshop were odour-related, and odour has many components. One nomination that was inadvertently omitted from the list was total carcinogens that affect a common end point. In both of these cases, it is very difficult to deal with multi-component issues and set AQOs because they are so hard to measure and monitor for. Various Government of Alberta departments are working on odour, and it can certainly be discussed today, but the focus needs to be on individual substances.
- Odour is an exception in that EPEA excludes odour as it pertains to agricultural operations. That Act could change in the future so that ambient objectives apply to all substances, but for now, the workshop will deal with what the Act currently regulates.

^{iv} See Appendix B for a list of these substances.

2.0 IDENTIFICATION OF PRIORITY SUBSTANCES

2.1 Breakout Group Work

Participants worked in three facilitated breakout groups to develop a list of substances for further discussion in the plenary session. As a starting point, participants were encouraged to use the information in the package distributed prior to the workshop. Experts familiar with the range of substances on the various lists circulated among the three breakout groups to answer any questions and provide additional insights as requested.

With reference to the information package, participants in their breakout groups nominated substances to be considered. The group discussed the nominated substances and why they should or should not be considered as candidates for the development of objectives. Each breakout group then prioritized its list to decide which substances should be presented for further consideration by all participants. The substance lists that were presented to the plenary session are show below in Table 1. The full lists considered by each group, along with further explanation and rationale, are shown in Appendix C.

Table 1 Priority Substances Identified by Breakout Groups

Group 1	Group 2	Group 3
Ammonia (environmental effects)	Mercury	Para-cresol
Mercury (environmental effects)	Radionuclides	Acrolein
Ultrafine particulate matter	Ultrafine particulate matter	Total reduced sulphur
Ozone (vegetation impacts)	Cadmium	Particulate matter
Para-cresol	Glyphosate	Carbonyl sulphide
Arsenic	Cobalt	Mercury
Acrolein	Lead	Radionuclides
Hydrogen sulphide	Para-cresol	
Acetaldehyde	Hydrogen sulphide	
Thiophenes		
Carbonyl sulphide		
Silica		

2.2 Priority List of Substances

After reviewing and discussing the three lists, workshop participants agreed by consensus to put forward the following list of priority substances for which ambient air quality objectives should be developed or for which existing objectives should be reviewed:

- Mercury
- Ultrafine PM
- Para-cresol
- Radionuclides

- Acrolein
- Carbonyl sulphide
- Hydrogen sulphide
- Ammonia (ecological effects)
- Arsenic
- Cadmium
- Volatile Organic Compounds (AENV to choose one or two based on health effects and ozone forming potential)

With respect to ammonia, participants noted that it was reviewed in 2004 and there is a one hour limit based on odour. One participant advised that recent work from Europe suggests that ammonia can have significant ecological effects at levels much lower than the limit set for odour. The direction from the workshop is that the work done in 2004 should be reviewed and an additional limit should be established that is based on ecological effects.

It was noted that mercury was on lists from previous priority setting workshops. The Canadian Council of Ministers of the Environment (CCME) has a Canada Wide Standard (CWS) for mercury and is focusing on controlling emissions. Ambient levels are relatively low so an AQO may not be particularly useful. However, concerns about mercury remain high, especially with respect to bioaccumulation, and it would be good to have a meaningful AQO that is measurable and could be associated with deposition. If that is not possible, then emissions controls are really the only option.

Participants agreed that odour and VOCs were important, but because of the challenges associated with mixtures, odour and VOCs should be addressed differently from the individual priority substances.

Odour: A significant number of nominations from the public involved odours, most of which related to agricultural operations. Workshop participants agreed that the odour issue is important but that odour represents a mixture for which an AAQO is unlikely to be developed because odour does not meet the necessary criteria for an AAQO. Thus, it is not within the scope of this workshop and will be handled outside the priority-setting process.

VOCs: Participants agreed to recommend that AENV select one or two VOCs that take into account the substance's ozone formation potential and its inherent toxicity and exposure, and develop an AQO for that (those) specific substance(s).

Concerns were noted about the potential health effects of mixtures. Mixtures are complex and difficult to address, requiring considerable time and resources. Alberta Environment should be encouraged to look at mixtures and their effect on air quality as opportunities arise.

**APPENDIX A
WORKSHOP PARTICIPANTS**

Priority-Setting Workshop Attendees

Name		Organization
Yayne-abeba	Akiliu	Alberta Environment, Northern Region
Jennifer	Allan	CASA
Atta	Atia	Alberta Agriculture
Angela	Ball	TransAlta Generation Partnership
Ann	Baran	Society for Environmentally Responsible Livestock Operations
Greg	Bereza	Alberta Environment (Aboriginal Relations)
Mike	Bisaga	Lakeland Industry and Community Association
Laura	Blair	Alberta Environment
Bill	Bocock	National Farmers Union
Maureen	Brown	City of Calgary
Tom	Burton	Alberta Association of Municipal Districts and Counties
Robert B.	Cash	Canadian Oilseed Producers
Kerra	Chomlak	CASA
Gerry	Cunningham	Metis Settlements General Council
Chad	Edwards	ATCO Power
Dorothy	First rider	Blood Tribe Consultation Coordinator
Long	Fu	Alberta Environment
Brian	Gilliland	Weyerhaeuser Company Limited
Geoff	Granville	Canadian Association of Petroleum Producers
Gustavo	Hernandez	CASA
Curtis	Horvath	NOVA Chemicals Corporation, Joffre
Linda	Jabs	CASA
Robyn	Jacobsen	CASA
Cecilia	Jeje	Suncor
Roger	Keefe	Imperial Oil Products & Chemicals Division
Myles	Kitagawa	Toxics Watch Society of Alberta
Bettina	Mueller	Alberta Environment
Dwayne	Nest	Tribal Chiefs Venture
Ian	Peace	Residents for Accountability in Power Industry Development
Mike	Queenan	Ecological Sound Planning and Community Evolvment
Greg	Rathjen	Town of Bentley
Ludmilla	Rodriguez	Alberta Health Services
Sheldon	Roth	University of Calgary
Natasha	Rowden	CNRL
Denis	Sauvageau	Friends of an Unpolluted Lifestyle
Rich	Smith	Alberta Beef Producers
David	Spink	Fort McKay Industrial Relations Corp.

Name		Organization
Wayne	Ungstad	Ponoka Fish and Game
Opel	Vuzi	Health Canada (Alberta Region)
Brian	Wiens	Environment Canada
Edna	Willier	Lesser Slave Lake Indian Regional Council
Ruth	Yanor	Mewassin Community Council

APPENDIX B
SUBSTANCES NOMINATED BY THE PUBLIC

SUBSTANCES

Hydrogen sulphide
Mercury from coal-fired power plants
acrolein

Sulphur oxides
Nitrogen oxides

MIXTURES

Automobile exhaust
Smoke from firepits
Sour gas
Emissions from flares
Emissions from oil and gas industry

Emissions from coal-fired energy generation
Materials used in outdoor furnaces
Total carcinogens (common endpoint)

AGRICULTURE

Odours from confined feeding operations
Crop sprays

INDOOR AIR QUALITY

Chemicals in laundry products (e.g. fabric softeners)
Air fresheners
Perfumes of all kinds in all products
Dryer sheets (smell from dryer vents)

LOCAL CONCERNS

Lethbridge human sewage treatment lagoon
Yeast/mouldy bread odours in north Lethbridge
Dust from gravel roads and construction sites

GREENHOUSE GAS EMISSIONS

CO₂
Methane

MISCELLANEOUS

Particles from tires (e.g., that affect the soil)
Chem trails

APPENDIX C
SUBSTANCES PRIORITIZED BY BREAKOUT GROUPS

Breakout Group 1

The group discussed the various substances, which appear below in their ranked order along with the points that emerged during the discussion.

1. Ammonia – environmental effects

- Current numbers are based on odor and those are based on being close to the sources
- Findings show that lichens and mosses in bogs can be affected by as little as 1 µg/cubic metre
- Need to better understand the impact of ammonia emissions on natural areas; i.e., boreal areas and sensitive understory plants
- There are indications that levels need to be lower than first thought
- Ammonia is important in particulate matter formation
- Natural sources of ammonia are present, as well as industrial sources
- Ammonia also affects livestock, but the magnitude of the effect varies

2. Intensive Livestock Odour

- Odour is part of the CASA vision and needs to remain on the radar
- Odour is subjective, so how do you monitor and/or model it?
- Odour management frameworks are not based on an AAQO
- Ammonia and hydrogen sulphide are based on odour thresholds and there must be a way to address them
- Odour is both a nuisance and a threat to human and environmental health
- Odour problems can sometimes be dealt with through specific compounds
- It could be possible to identify a surrogate standard or objective, but it is tough to find a surrogate
- There is a need for relative consistency where odour is resolved between EPEA and the CASA vision
- Much of the concern regarding odour can be attributed to “factory farming”
- Odours are greatest when the barns are vented
- The impact of the odour depends on the person smelling it
- There are chemicals that affect both air and water quality
- The elders talk about the loss of frogs, which is an indicator of ecosystem health, so is it air or water related? What is going into the air that will fall and affect ecosystems?
- First Nations consider how future generations will be affected

3 Smokestack from Swan Hills Treatment Plant

- Better consultation and communication is needed as the Lesser Slave Lake First Nations surrounds the plant
- There are many fears regarding the plant and there is no clear picture of the effects
- Oil and gas flares as well as feedlots are causing odours
- There is monitoring for dioxins and furans
- The concerns being voiced should create a dialogue between all concerned
- Consider working with an airshed or form an airshed; what is the potential for either the Peace or West Central airshed to change their borders?
- It is difficult and expensive to monitor minute amounts as they may fall below detection levels – deposition monitoring to determine critical loads

4. **Mercury**

- Coal-fired power plants are major sources of mercury emissions; health warnings about fish are increasing
- Consultations are required regarding power plants
- CASA had the Electricity Project Team in 2002-03 and more recently the Electricity Framework Review
- According to the NPRI, emissions are affecting health and creating both health and environmental issues
- Alberta is seeing increased expansion of power generation and transmission
- This is a challenging issue because we end up with mercury emissions from offshore and global sources
- Generally, small amounts are emitted and it is the accumulations that are of concern
- There must be an appropriate ambient level for various species of mercury
- Mercury was nominated as a priority substance in 2004, so AENV is aware of the issues; the background work should make it easier to set an objective
- Mercury also occurs naturally
- With the probable growth in Alberta, we should be prepared for increases and take a proactive approach
- Having an AQO will move us to action

5. **Particulate Matter (PM), Ozone and Volatile Organic Compounds (VOCs)**

- PM_{2.5} is regularly monitored and PM₁₀ is an older standard, as is Total Suspended Particulates (TSP), which is why there is no 24-hour standard for PM₁₀
- The health impacts of PM₁₀ are covered by TSP and PM_{2.5} therefore the decision was made to focus on PM_{2.5}
- The focus should now be on ultra-fine PM which is less than 200 nanometers – PM_{0.2} and is a sub-micron
- PM is currently monitored as a mass concentration whereas PM_{0.2} is a numerical concentration and is completely related to human health effects
- PM_{0.2} is not and will not be characterized and it does not matter what the chemical is – there can be a problem
- We will have a national annual standard for PM_{2.5} and a lower 24-hour standard for PM_{2.5}

6. **Ozone**

- Detrimental to human health and plant growth
- Ozone affects the nitrogen-fixing properties of legumes
- There is a federal initiative that will lower the current 8-hour standard and produce a lower seasonal standard
- Ozone is a secondary pollutant as it is not directly emitted
- Ozone precursors are oxides of nitrogen (NO_x) and VOCs
- To control ozone, the precursors must be controlled, specifically VOCs
- Canada Wide Standards (CWS) are not necessarily protective of vegetative species
- Should a seasonal vegetative standard be considered? Would AENV consider this in light of the fact that any federal standard is several years in the future?

7. **Indexed VOC as an Ozone Precursor**
 - This was covered under both PM and Ozone
8. **Carbon Disulphide**
 - A phantom gas that has had a significant impact on human health
 - A 2005 objective was developed and the group agreed that this would not need to go forward as a priority substance
9. **Para-cresol**
 - This is a surrogate for the class of cresols
 - Acting on P-cresol would deal with the concerns about odours from sewage and manure
10. **Arsenic**
 - Results from combustion of fossil fuels, etc. and does not have a standard in Alberta
 - Should be reviewed to determine a level
11. **Acrolein**
 - Potential health effects from both an ambient and an indoor air quality perspective
 - Big data gap
12. **Hydrogen Sulphide**
 - It is both a nuisance and a health issue
 - It has been reviewed in the past, but not for awhile
 - The effect of low level exposures is unknown
 - Is the current objective, based partly on odour, stringent enough?
 - Current thresholds translate into nuisance and this is what should be reviewed
13. **Acetaldehyde**
 - Human health concerns and a nuisance
 - AQO was done in 1999 and should be revisited
14. **Thiophenes**
 - These are odourous compounds with no known sources but are detected at high levels and are potentially toxic
 - They have been picked up in VOC canister sampling in the Fort McMurray area
 - Not a great deal of data available
15. **Carbonyl Sulphide**
 - Emitted by a variety of sources
 - A volatile emission that has not been addressed, and there is a data gap
16. **Silica**
 - Silica is present in many substances and we are exposed through road construction, gravel pits, agriculture and sand for playgrounds
 - This is normally deal with as particulate matter and has been captured in the earlier discussions on TSP/PM

In summary, breakout group one produced the following ranked list of priority substances:

1. Ammonia – environmental effects
2. Intensive livestock odor – separate statement on odor
3. Smokestack from Swan Hills Treatment Plant (This is an issue between local residents and the facility, and a better process is needed to ensure community issues are addressed by the operator and the province. This issue is outside the process for developing AQOs.)
4. Mercury – environmental effects
5. Particulate Matter
6. Ozone
7. Carbon disulphide
8. Ozone precursors – indexed Volatile Organic Compounds
9. P-cresol
10. Arsenic
11. Acrolein
12. Hydrogen sulphide
13. Acetaldehyde
14. Thiophenes
15. Carbonyl sulphide
16. Silica

Breakout Group 2

The group nominated substances that were important to them, reviewing those in Appendices B and C of the invitation and discussing if they should be added to the priority list. They agreed to a list of criteria for determining priorities that was a useful touchstone for the conversation. The criteria were:

- Human health impacts
- Animal and environmental impacts
- Volume of emissions – are they known? Measured?
- Ability to manage
- Risk – acute and chronic
- Ability to measure / monitor
- Past / current / future concern – has this been a concern for awhile?
- Specific pollutant – a “poster child”^{vi} or a single substance

When the group agreed that a substance should be on the priority list, “consensus” was noted after the substance. When the group did not have consensus, members voted, and the parenthetical number after some substances is the number of votes for that substance. In other cases, the group chose to make a recommendation about how the substance should be treated. The text summarizes the discussion about each substance.

Substances

- Mercury (Consensus):
Decreases are expected very soon as a result of the mercury controls that have to be installed for coal-fired electricity generation. Plants have to reduce their emissions by 75% by January 1, 2010, meaning controls will be installed next year. The group felt an AQO could be a useful tool to measure the impact of the technology.
- Radionuclides (Consensus):
Radionuclides result from nuclear and coal electricity generation. There is evidence that shows cellular effects on humans. There were questions if this is in the province’s jurisdiction and if it is premature to develop an AQO in Alberta. The group did agree to forward radionuclides by consensus, but thought it was likely a two-stream approach: the provincial government could either develop an AQO or participate in federal processes.
- Ultrafine PM (Consensus):
The group felt this is an emerging issue and the information available thus far is showing significant potential for health effects. The group was of the view that ultrafine PM could be monitored.
- Cadmium (13):
The sources of cadmium are coal and bitumen. Alberta’s bitumen is especially high in cadmium. The group thought future exploration and development could increase the ambient levels, making cadmium a potentially important future issue. The ambient levels, as far as the group knew, were not known at this time; however, 393 kg were released in 2007.

^{vi} “Poster child” was a term used to refer to a single pollutant that is representative of a group, e.g., VOCs

- Glyphosate (8):
Glyphosate is commonly known as Round-Up™. It is an insecticide and is causing issues with honeybees.
- Lead (3):
Concerns were raised that levels of lead could be increasing. In 2007, 2100 kg were released in Alberta. The sources include smelting, pulp mills, aviation fuels and coal. Lead has been removed from gas. The AQO was developed in 1999 and the group thought that not a lot has changed since then.
- Cobalt (3):
The group did not discuss this at length, but there were concerns that the heavy metal produced by the electricity sector has health and environmental impacts.
- Para-cresol (2):
The group felt there is a gap in information about this substance. It seems there are many concerns from the agricultural sector, but the breakout group did not know if it could be measured and wanted more information on its health and environmental effects.
- Hydrogen sulphide H₂S (2):
An AQO is in place and was updated in 2005. The group was aware that work had been occurring on H₂S on a regular basis and the update was to include odour. The science is fairly weak about the effects of H₂S at low doses. The group wasn't sure what new research there would be that could change the work recently done on the AQO. There were questions if recommending H₂S would have any value, however it should be a standard that is continually improved.
- Greenhouse Gases such as CO₂ and Methane (Methane 0 votes):
Greenhouse gases were identified as an emission, not a pollutant. CO₂ was dropped from the list and the group considered methane only. Federal processes are going to require that greenhouse gas emissions be reported already. The group was unsure of the added benefit of a provincial AQO. In the end, no one voted for methane, but the group did not want to remove it from the overall list.
- PAHs such as dioxins and furans (dropped from the list by consensus):
The group felt that benzo(a)pyrene (BaP) is currently used as the poster child for this group and a new AQO is in place.
- Odour from agriculture and forest fires (recommendation):
The group discussed odour in terms of its health effects, recognizing that agricultural odours are outside AENV's mandate and that odour is a mix of substances. Instead of removing odour from the list of substances, the group agreed to a recommendation that reinforced that odour is important and should be addressed. It was noted that other jurisdictions measure odour and have set limits.
- VOCs (recommendation):
VOCs are important ozone precursors and contribute to smog. However, the group noted VOCs are a large group of chemicals. There is a need to choose a poster child for the VOCs, but the

group did not feel it had sufficient expertise or information to do that at the workshop. Instead, they wanted to make a recommendation that Alberta Environment choose an appropriate VOC and develop an AQO for that chemical.

- **Mixtures (recommendation):**

Mixtures of substances can have a cumulative impact on humans and the environment. It was recognized that AQOs are not the appropriate tool to address mixtures because AQOs are for single substances. The group did not want to lose the idea and agreed to a recommendation that an assessment tool be developed to address mixtures of substances.

Breakout Group 3

The group nominated substances that were important to them, reviewing those in Appendix B and C of the invitation and discussing if they should be added to the list. Participants developed by consensus a list of criteria to consider when determining priorities including:

- Is the substance a good indicator of the overall concern; i.e., do we get the most bang for the buck by nominating this substance?
- Urgency
- Is there an opportunity for real improvement?
- Can we measure and/or monitor this substance effectively?

In addition to nominating substances for further work, the group reaffirmed the importance of continuing work on benzene, particulate matter, SO₂, NO₂, ammonia, and hydrogen sulphide. The group recognized that work is being undertaken related to the ambient air quality objectives for these six substances and therefore did not nominate them as priorities.

Substances:

- Cresol
Concerns related to cresol included odour, carcinogenic effects, and the lack of information on occupational health hazards. Para-cresol was of particular concern.
- Acrolein
Alberta Health has raised concerns about the health impacts of this substance in the past.
- Total Reduced Sulphur (TRS)
It was felt that TRS may be a good proxy for odour issues. The group felt that Alberta Environment could do some work to select a good representative substance out of the range of substances that fall under the TRS category.
- Volatile Organic Compounds (VOCs)
VOCs were noted as precursors for odour and smog. It was mentioned that these substances are quite toxic and there are currently some unregulated sources. The group felt that some representative substances in this category could be cyclohexane and propylene.
- Mercury
There were concerns about the health effects of mercury. There was some discussion whether mercury was mainly an ambient issue or a source issue. A process is in place to handle mercury from emissions.
- Particulate Matter (PM)
Concerns were raised about health concerns for the range of PM particle sizes. It was also mentioned that no sectors should be exempt from meeting the objective. (There were particular concerns about the agricultural sector being exempt from PM AAQOs.) There was particular concern raised about ultrafine PM, as there is currently no objective for it.
- Radionuclides
The concerns raised about radionuclides were linked to potential nuclear development in Alberta. Health Canada does monitor routinely in Alberta now, so baseline data is being gathered.

- Carbonyl Sulphide
This substance was mentioned because, according to the NPRI, there are significant annual releases and it is a toxic substance.