

*Clean Air Strategic Alliance*  
**Animal Health Project Team**

**Survey Results:  
Air Quality Impacts on Animal Health**

**REPORT**

October 8, 2001

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## **1.0 EXECUTIVE SUMMARY AND RECOMMENDATIONS**

### **1.1 BACKGROUND**

The purpose of this survey was to compile a thorough list of the issues and concerns related to the impacts of air quality on animal health in Alberta.

The survey was conducted by the Animal Health Project Team of the Clean Air Strategic Alliance (CASA) to ensure that all of the members of the Team share a common knowledge of the range of issues and concerns, and to help set the direction of the Team's work.

### **1.2 DISTRIBUTION OF SURVEY**

The survey was distributed in May 2000 to approximately 1590 individuals from government, industry, non-governmental organizations, and the public. This was not a random sample of the Alberta population, but instead this survey was sent to members of the Clean Air Strategic Alliance (CASA), Small Explorers and Producers Association of Canada (SEPAC), Wild Rose Agricultural Producers and the National Farmers Union.

### **1.3 THE RESPONDENTS**

There were 154 respondents to the survey. 30 of the respondents indicated that they had experienced problems regarding air quality on animal health, hereto after referred to as 'The 30 Subset.'

### **1.4 SURVEY ANALYSIS**

The question-by-question analysis of the survey, summarized below, focused on both the total number of responses, and on The 30 Subset.

It is important to note, that the accuracy of the results of the survey is limited by the inconsistency of the respondents' methods in ranking.

For example, in question 2 the respondents were instructed to rank a list of emission sources. They were to rank the source they saw as most significant as 1, the second most significant as 2 and so on; and to rank as many as they wished. However, some respondents ranked one source as 1, another source as 2, up until perhaps 5 or perhaps until all on the list were ranked. Other respondents marked three different sources as 1, one source as 2, and four sources as 3. And yet other respondents simply checked off a number of sources. In this case, the recorder entered all checked sources as 1. For example, if five were checked, they were all recorded as 1.

#### *1.4.1 Question 1: Air Quality*

*"How would you rate the air quality in your region? (circle one): very good good average poor very poor don't know no answer"*

#### **Results for Total Respondents (154)**

65% responded that the air quality was very good or good, 24% responded that it was average, while 11% responded that it was poor or very poor. 10% responded as "Don't Know" or "No Answer."

### **Results for The 30 Subset**

13% responded that the air quality was good, 50% said average, and 30% said poor.

#### *1.4.2 Question 2: Emission Sources\**

*“What emission sources, if any, do you see affecting the current air quality in your region?”*

### **Results for Total Respondents (154)**

The Respondents were asked to select and rank emission sources and were not limited in the number of emission sources they could select. The total number of emission selections was 792. Of that the highest percentage of selections was *Road Dust* at 10%. *Vehicles* accounted for 9% of the selections and *Oil and Gas Processing Plants* received 8% of the selections.

### **Results for The 30 Subset**

Total number of emission selections was 214. *Oil and Gas Processing Plants* and *Well Test Flaring* received 10% of selections. *Sour Gas Release* received 8%. *Road Dust*, *Vehicles*, and *Spills and Leaks-Oil and Gas* each received 6%.

### **Grouping Analysis**

The results for question two were also analysed by grouping the individual emission sources by sector.

**Total Respondents (154):** *Oil and Gas* (30%), *Vehicles* (19%), *Agriculture* (17%), *Forest Fires* (6%), *Waste* (5%).

**The 30 Subset:** *Oil and Gas* at 48%, *Agriculture* at 14%, *Vehicles* at 12%, *Forest Fires* at 5%, *Waste* at 4%, etc.

#### *1.4.3 Question 3: Animal Health Impact*

*“Have you experienced any problems regarding air quality impacts on animal health? (circle one): Yes No (go to Q.6) Don’t Know (go to Q.6) No Answer (go to Q.6)”*

### **Results for Total Respondents (154)**

30 respondents (19%) indicated that they had experienced problems regarding air quality effecting animal health. This is the group referred to as The 30 Subset.

25% did not know or did not answer. 56% reported they had not experienced problems.

The 30 Subset who did experience problems, were asked to indicate what health effects were experienced (question 4) and under what conditions did the effects occur (question 5).

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\* It is important to note that the accuracy of the results of the survey is limited by the inconsistency of the respondents’ methods in ranking. See discussion under “Survey Analysis.”

#### 1.4.4 Question 4: Effects\*

“What are the effects that you are aware of regarding air quality impacts on animal health?”

##### **Results for The 30 Subset**

The TOTAL number of health effect selections was 245.

Irritated eyes accounted for the most selections at 8%. *Fertility Problems-Female, Abortions*, and *Decreased Productivity* each accounted for 7% of selections.

##### **Grouping Analysis**

The individual health effects selected were also grouped according to health effect categories. The top four categories were: *Reproductive* (31%), *Irritations* (20%), *Unthriftiness/Reduced Productivity* (16%) and *Suppressed Immune System/Deformities* (9%).

#### 1.4.5 Question 5: Conditions\*

“In your experience, which of the conditions below have contributed to air pollution impacts on animal health?”

##### **Results for The 30 Subset**

The total number of condition selections was 145. *Nearness to Emission Source* accounted for the largest number of selections at 16%. *Combined Emissions, Type of Pollutant, Severity of Emission*, and *Wind Direction* each received 12% of selections.

#### 1.4.6 Question 6: Actions to Consider

Responses received for question 6 are discussed later in this report.

#### 1.4.7 Question 7: Other Comments

Responses received for this question are discussed later in this report.

#### 1.4.8 Question 8: Demographics and Location

Respondents were asked to provide demographic information according to the following: *Agricultural, Oil and Gas, Concerned Citizen, Other*. They could mark more than one. The respondents were also asked to indicate location. 146 responses were given regarding location: 20% urban and 80% rural.

##### **Results for Total Respondents (154)**

169 responses were given: 59% of the respondents reported they were *Agricultural*, 12% - *Oil and Gas*, 20% - *Concerned Citizen*, and 10% - *Other*.

##### **Results for The 30 Subset**

38 responses were given: 71% - *Agricultural*, 11% - *Oil and Gas*, 13% - *Concerned Citizen*, and 5% - *Other*. *Location* - 7% urban and 93% rural.

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\* It is important to note that the accuracy of the results of the survey is limited by the inconsistency of the respondents' methods in ranking. See discussion under “Survey Analysis.”

#### 1.4.9 *Written Comments*

Respondents were given the opportunity to provide additional comments regarding emissions sources, health effects, and conditions. They were also asked to suggest action(s) the project team should consider taking in order to address the issue of air quality impacts on animal health.

The following list represents a summary of the written comments received:\*

- ❑ Address issues associated with intensive livestock operations (from manure handling, to conditions etc)
- ❑ Improve air quality monitoring (more parameters, high-tech, continuous, ppb)
- ❑ Conduct comprehensive chemical analysis of flare gas as well as emissions from other industrial facilities
- ❑ Take into consideration/assess animal husbandry practices
- ❑ Continue with existing studies/conduct credible scientific studies - epidemiology, exposure, toxicology.
- ❑ Improve air quality by reducing and/or eliminating emissions
- ❑ Conduct research into effects of fertilizers, pesticides, herbicides (consider alternates to spraying etc)
- ❑ Improve monitoring and inspection of facilities and enforcement of standards/regulations
- ❑ Continue to have input to the Western Canada Cattle Study; monitor the study closely to ensure correct question is being asked
- ❑ Establish system of better record keeping for herds

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\* The complete list of additional comments is contained in Section 4.0 of this report.

## **1.5 RECOMMENDATIONS OF THE SURVEY SUBGROUP TO THE AHPT**

- ❑ Accept the final survey report as complete.
- ❑ Accept the content of the report as information with the recognition that the purpose of the survey was to compile a thorough list of the issues and concerns related to the impacts of air quality on animal health in Alberta.
- ❑ Review the written comments received from Respondents and ensure that any issues raised that do not fall within the scope of the work of the AHPT be forwarded to the appropriate government agency or stakeholder.
- ❑ Publicly release the results of the survey final report and make the appendix of the survey available upon request.
- ❑ Send a copy of the final survey report to all Respondents that indicated an interest in being kept informed about the progress of the AHPT.

## 2.0 PART A: SURVEY RESULTS

### 2.1 SUMMARY OF RESPONSES BY QUESTION

#### 2.1.1 Question 1: AIR QUALITY

**Survey Question:** *How would you rate the air quality in your region? (circle one)*  
*very good good average poor very poor don't know no answer*

TABLE 1 SUMMARY OF RESPONSES TO QUESTION 1

Air Quality	Summary	Percentage
Very Good	30	20%
Good	54	35%
Average	37	24%
Poor	16	10%
Very Poor	2	1%
Don't Know	4	3%
No Answer	11	7%
<b>TOTAL:</b>	<b>154</b>	<b>100%</b>

79% of respondents rated the air quality as average, good, or very good; 7% did not respond to this question.

#### 2.1.2 Question 2: EMISSION SOURCES

**Survey Question:** *What emission sources, if any, do you see affecting the current air quality in your region?*

As mentioned in the Executive Summary, the accuracy of these results is limited by the inconsistency of the respondents' methods in ranking.

TABLE 2 SUMMARY OF RESPONSES TO QUESTION 2

A	B	C	D	E	F	G	H
Emission Source	# of Times Selected	% # of Times Selected	% Ranked	Range of Ranking	Ranked #1	Ranked #2	Ranked #3
Road Dust	80	10%	52	1-26	30	17	10
Vehicles	71	9%	46	1-11	29	9	7
Oil and Gas Processing Plants	60	8%	39	1-12	26	13	7
Routine Flaring	52	7%	34	1-14	25	7	7
Forest Fires	50	6%	33	1-14	19	7	4
Intensive Livestock Operations	49	6%	32	1-16	12	7	9
Well Test Flaring	47	6%	31	1-17	19	6	7
Agricultural Dust	46	6%	30	1-25	11	9	9
Sour Gas Release	39	5%	25	1-15	20	6	3
Pesticide Application	39	5%	25	1-20	9	6	7

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<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
<b>Emission Source</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>	<b>Ranked #1</b>	<b>Ranked #2</b>	<b>Ranked #3</b>
Spills and Leaks - Oil and Gas	26	3%	17	1-17	6	2	4
Brush Burning	24	3%	16	1-22	8	5	0
Residential Heating	23	3%	15	1-18	4	2	5
Electrical Generation	22	3%	14	1-27	3	5	4
Chemical Producing Industry	18	2%	12	1-25	8	3	0
Fertilizer Application	17	2%	11	1-19	2	6	2
Glycol Dehydrators	14	2%	9	1-22	6	1	1
Waste Treatment Facilities	14	2%	9	1-10	3	3	1
Landfills	13	2%	8	1-18	2	0	1
Forest Products Industry	12	2%	8	1-21	2	4	2
Garbage Burning	12	2%	8	1-16	1	2	2
Aircraft	9	1%	6	1-24	3	2	0
Forestry Operations	9	1%	6	1-20	2	1	1
Trains	8	1%	5	1-27	1	1	1
Food Processing Plants	8	1%	5	2-23	0	1	1
Mining	4	1%	3	1-26	1	0	0
Mine Ore Processing	2	0.25%	1	8-24	0	0	0
Other 1	21	3%					
Other 2	3	0.38%					
<b>TOTAL:</b>	<b>792</b>	<b>102.63%*</b>					

*\* Due to rounding off to the nearest whole number, Column C's total does not equal 100%.*

*A. Emission Source - emission sources (27) listed in Question 2 of the survey*

*B. # of Times Selected - number of times the 154 respondents selected source*

*C. % # of Times Selected - # of Times Selected divided by total (792)*

*D. % Ranked - percentage of respondents (out of 154) that ranked source (# of Times Selected divided by 154)*

*E. Range of Ranking - the lowest rank and highest rank given for source*

*F. Ranked #1 - the number of times source was ranked as 1*

*G. Ranked #2 - the number of times source was ranked as 2*

*H. Ranked #3 - the number of times source was ranked as 3*

Another way of grouping these responses for Question 2 is shown in Table 3. An emission is listed in order of the percentage of times it was selected (Column C) which is Column B divided by its total of 792. For example, the first sector listed, Oil and Gas, was selected 30% of the time by the 154 respondents, with Oil and Gas Processing Plants as the highest individual emission source selected. Columns D and E are consistent with the previous Table 2 to reflect continuity between tables and for easy reference to the new data shown in this table.

TABLE 3 EMISSION SOURCES IDENTIFIED BY RESPONDENTS

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>Source</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>
<b>OIL AND GAS</b>		<b>30%</b>		
Oil and Gas Processing Plants	60	8	39	1-12
Routine Flaring	52	7	34	1-14
Well Test Flaring	47	6	31	1-17
Sour Gas Release	39	5	25	1-15
Spills and Leaks - Oil and Gas	26	3	17	1-17
Glycol Dehydrators	14	2	9	1-22
<b>VEHICLES</b>		<b>19%</b>		
Road Dust	80	10	52	1-26
Vehicles	71	9	46	1-11
<b>AGRICULTURE</b>		<b>17%</b>		
Intensive Livestock Operations	49	6	32	1-16
Agricultural Dust	46	6	30	1-25
Pesticide Application	39	5	25	1-20
Chemical Producing Industry	18	2	12	1-25
<b>FOREST FIRES</b>	50	<b>6%</b>	33	1-14
<b>WASTE</b>		<b>5%</b>		
Waste Treatment Facilities	14	2	9	1-10
Landfills	13	2	8	1-18
Garbage Burning	12	2	8	1-16
<b>BRUSH BURNING</b>	24	<b>3%</b>	16	1-22
<b>RESIDENTIAL HEATING</b>	23	<b>3%</b>	15	1-18
<b>ELECTRICAL GENERATION</b>	22	<b>3%</b>	14	1-27
<b>FERTILIZER APPLICATION</b>	17	<b>2%</b>	11	1-19
<b>FOREST PRODUCTS INDUSTRY</b>	12	<b>2%</b>	8	1-21
<b>FORESTRY OPERATIONS</b>	9	<b>1%</b>	6	1-20
<b>AIRCRAFT</b>	9	<b>1%</b>	6	1-24
<b>TRAINS</b>	8	<b>1%</b>	5	1-27
<b>FOOD PROCESSING PLANTS</b>	8	<b>1%</b>	5	2-23
<b>MINING</b>	4	<b>1%</b>	3	1-26
<b>MINE ORE PROCESSING</b>	2	<b>0.25%</b>	1	8-24

In Table 4 an arbitrary multiplier was used to weight the ranking. This was done by Table 2's Column F "Ranked #1" being multiplied by 3, Column G "Ranked #2" being multiplied by 2, and Column H "Ranked #3" being multiplied by 1, and then summing the three totals. This was done as a way of scoring the value of the rankings. It gives a cumulative value of the rankings.

TABLE 4 RESPONDENTS RANKINGS OF EMISSION SOURCES

Source	Sum of #1x3 #2x2 #3x1	% of Weighting
<b>OIL AND GAS</b>	<b>405</b>	<b>38%</b>
Oil and Gas Processing Plants	111	
Routine Flaring	96	
Well Test Flaring	76	
Sour Gas Release	75	
Spills and Leaks - Oil and Gas	26	
Glycol Dehydrators	21	
<b>VEHICLES</b>	<b>246</b>	<b>24%</b>
Road Dust	134	
Vehicles	112	
<b>AGRICULTURE</b>	<b>165</b>	<b>15%</b>
Agricultural Dust	60	
Intensive Livestock Operations	59	
Pesticide Application	46	
Chemical Producing Industry	30	
<b>FOREST FIRES</b>	<b>75</b>	<b>7%</b>
<b>BRUSH BURNING</b>	<b>34</b>	<b>3%</b>
<b>WASTE</b>	<b>32</b>	<b>3%</b>
Waste Treatment Facilities	16	
Garbage Burning	9	
Landfills	7	
<b>RESIDENTIAL HEATING</b>	<b>23</b>	<b>2%</b>
<b>ELECTRICAL GENERATION</b>	<b>23</b>	<b>2%</b>
<b>FERTILIZER APPLICATION</b>	<b>20</b>	<b>2%</b>
<b>FOREST PRODUCTS INDUSTRY</b>	<b>16</b>	<b>1%</b>
<b>AIRCRAFT</b>	<b>15</b>	<b>1%</b>
<b>FORESTRY OPERATIONS</b>	<b>9</b>	<b>.8%</b>
<b>TRAINS</b>	<b>6</b>	<b>.5%</b>
<b>MINING</b>	<b>3</b>	<b>.3%</b>
<b>FOOD PROCESSING PLANTS</b>	<b>3</b>	<b>.3%</b>
<b>MINE ORE PROCESSING</b>	<b>0</b>	<b>0%</b>
<b>TOTAL:</b>	<b>1075</b>	<b>99.9%*</b>

\* Due to rounding off to the nearest whole number, the % of Weighting does not equal 100%.

The total possible score for all emissions is 1075. Oil and gas scored the highest at 405 out of 1075 or 38%.

For Question 2 the following emission sources were listed as “Other” (survey number in brackets):

- ◆ lime plants (7)
- ◆ [local] sewage field (22)
- ◆ chemical flaring (well workovers, etc.) (23)
- ◆ periodic range grass fires (25)
- ◆ local peat moss burning power plant (30)
- ◆ [local] meat processing company/slaughter house (38)
- ◆ unplugged seismograph test holes allowing mixing of water veins (55)
- ◆ sludge farming (oilfield waste) (61)
- ◆ air spraying (65)
- ◆ grass fires (66)
- ◆ construction (86 and 149)
- ◆ oil refineries (92)
- ◆ wind blown dust from mountains (102)
- ◆ pulp and stranboard operations
- ◆ unflared well tests (125)
- ◆ road dust from intensive livestock operations (125)
- ◆ compressor station flaring (131)
- ◆ herbicide application (133, 139, and 154)
- ◆ town lagoon (138)
- ◆ oil wells (138)
- ◆ herbicide (139)
- ◆ weather (149)

A summary of the written comments to this question is found in Table 19.

### 2.1.3 Question 3: IMPACTS

<b>Survey Question:</b>	<i>Have you experienced any problems regarding air quality impacts on animal health? (circle one)</i> <i>Yes No (go to Q.6) Don't Know (go to Q.6) No Answer (go to Q.6)</i>
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56% of respondents did not experience any problems regarding air quality impacts on animal health, while 19% did. The remaining 25% did not know or did not have an answer.

TABLE 5 SUMMARY OF IMPACTS ON ANIMAL HEALTH RANKING RESULTS

<b>Response</b>	<b>Summary</b>	<b>Percentage</b>
Yes	30	19
No	86	56
Don't Know	21	14
No Answer	17	11
<b>TOTAL:</b>	<b>154</b>	<b>100</b>

*Response - list of choices as listed in survey*

*Summary - number of responses (total 154) for each choice*

2.1.4 Question 4: EFFECTS

**Survey Question:** *What are the effects that you are aware of regarding air quality impacts on animal health?*

Again, as with all results in this report, the accuracy of the numbers is limited by the inconsistency of the respondents methods in ranking.

The results captured in the chart below are from The 30 Subset. (Two respondents answered this question, when they answered “no” to Question 3, but were NOT recorded in the empirical , results below.)

TABLE 6 SUMMARY OF RESPONSES TO QUESTION 2

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
<b>Effects</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>	<b>Ranked #1</b>	<b>Ranked #2</b>	<b>Ranked #3</b>
Irritated Eyes	19	8%	63	1-8	11	3	1
Fertility Problems-Female	18	7%	60	1-9	8	5	1
Abortions	17	7%	57	1-6	10	3	2
Decrease Productivity	16	7%	53	1-6	12	2	0
Unthriftiness	15	6%	50	1-5	10	2	1
Respiratory Problems	14	6%	47	1-7	7	0	2
Mortality	14	6%	47	1-11	6	2	2
Increased Calving Interval	13	5%	43	1-6	7	1	1
Suppressed Immune System	12	5%	40	1-7	7	1	1
Irritated Nose	11	4%	37	1-6	8	0	1
Still Births	11	4%	37	1-6	6	1	2
Problems During Birth	9	4%	30	1-6	6	2	0
Deformities	9	4%	30	1-10	5	0	1
Reduced Milk Production	8	3%	27	1-6	5	1	0
Twinning	8	3%	27	1-6	3	2	2
Fertility Problems-Male	7	3%	23	1-10	5	0	0
Skin Problems	6	2%	20	1-6	4	0	0
Poor Mothering	6	2%	20	1-6	4	1	0
Increased Aggression	6	2%	20	1-6	2	1	2
Increased Time of First Calving	5	2%	17	1-6	4	0	0
Other 1	11	4%					
Other 2	7	3%					
Other 3	3	1%					
<b>TOTAL:</b>	<b>245</b>	<b>98%*</b>					

\*Due to rounding off to the nearest whole number, Column C's total does not equal 100%.

A. Effect - health effects (20) listed in Question 4 of the survey

B. # of Times Selected - number of times the 30 respondents selected effect

C. % # of Times Selected -# of Times Selected divided by total (245)

*D. % Ranked* - percentage of respondents (out of 30) that ranked effect (# of Times Selected divided by 30)

*E. Range of Ranking* - the lowest rank and highest rank given for effect

*F. Ranked #1* - the number of times effect was ranked as 1

*G. Ranked #2* - the number of times effect was ranked as 2

*H. Ranked #3* - the number of times effect was ranked as 3

Another way of grouping the responses for Question 4 is shown in Table 7. An effect is listed in order of the percentage of the number of times it was selected (Column C). This figure in Column C was determined by dividing Column B by its total (total=245). For example, the first category listed, Reproductive, is the category the 30 respondents selected 31% of the time. Irritated Eyes was the highest individual health effect selected at 8%. Columns D and E are consistent with the previous Table 6 to reflect continuity between tables and for easy reference to the new data shown in this table.

TABLE 7 EFFECT IDENTIFIED BY RESPONDENTS

<b>A</b> <b>Effects</b>	<b>B</b> <b># of Times Selected</b>	<b>C</b> <b>% # of Times Selected</b>	<b>D</b> <b>% Ranked</b>	<b>E</b> <b>Range of Ranking</b>
<b>REPRODUCTIVE</b>		<b>31%</b>		
Fertility Problems-Female	18	7	60	1-9
Abortions	17	7	57	1-6
Increased Calving Interval	13	5	43	1-6
Still Births	11	4	37	1-6
Twinning	8	3	27	1-6
Fertility Problems-Male	7	3	23	1-10
Increased Time of First Calving	5	2	17	1-6
<b>IRRITATIONS</b>		<b>20%</b>		
Irritated Eyes	19	8	63	1-8
Respiratory Problems	14	6	47	1-7
Irritated Nose	11	4	37	1-6
Skin Problems	6	2	20	1-6
<b>UNTHRIFTINESS/REDUCED PRODUCTION</b>		<b>16%</b>		
Decrease Productivity	16	7	53	1-6
Unthriftiness	15	6	50	1-5
Reduced Milk Production	8	3	27	1-6
<b>SUPPRESSED IMMUNE SYSTEM/DEFORMITIES</b>		<b>9%</b>		
Suppressed Immune System	12	5	40	1-7
Deformities	9	4	30	1-10
<b>MORTALITY</b>	14	<b>6%</b>	47	1-11
<b>PROBLEMS DURING BIRTH</b>	9	<b>4%</b>	30	1-6
<b>POOR MOTHERING</b>	6	<b>2%</b>	20	1-6
<b>INCREASED AGGRESSION</b>	6	<b>2%</b>	20	1-6

In Table 8 an arbitrary multiplier was used to weight the ranking. This was done by Table 6's Column F "Ranked #1" being multiplied by 3, Column G "Ranked #2" being multiplied by 2, and Column H "Ranked #3" being multiplied by 1, and then summing the three totals. This was done as a way of scoring the value of the rankings. It gives a cumulative value of the rankings.

TABLE 8 RESPONDENTS RANKING OF EFFECTS

<b>Effect</b>	<b>Sum of #1x3 #2x2 #3x1</b>	<b>% of Weighting</b>
<b>REPRODUCTIVE</b>	<b>161</b>	<b>35%</b>
Abortions	38	
Fertility Problems-Female	35	
Increased Calving Interval	24	
Still Births	22	
Fertility Problems-Male	15	
Twinning	15	
Increased Time of First Calving	12	
<b>IRRITATIONS</b>	<b>100</b>	<b>22%</b>
Irritated Eyes	40	
Irritated Nose	25	
Respiratory Problems	23	
Skin Problems	12	
<b>UNTHRIFTINESS/REDUCED PRODUCTION</b>	<b>92</b>	<b>20%</b>
Decrease Productivity	40	
Unthriftiness	35	
Reduced Milk Production	17	
<b>SUPPRESSED IMMUNE SYSTEM/DEFORMITIES</b>	<b>40</b>	<b>9%</b>
Suppressed Immune System	24	
Deformities	16	
<b>MORTALITY</b>	<b>24</b>	<b>5%</b>
<b>PROBLEMS DURING BIRTH</b>	<b>22</b>	<b>5%</b>
<b>POOR MOTHERING</b>	<b>14</b>	<b>3%</b>
<b>INCREASED AGGRESSION</b>	<b>10</b>	<b>2%</b>
<b>TOTAL:</b>	<b>463</b>	<b>100%</b>

The total possible score for all effects is 463. Reproductive was the highest at 161 out of 463 or 35%.

For Question 4 the following effects were also listed (survey number in brackets):

- ◆ uterine inertia (6)
- ◆ hermaphrodites (6)
- ◆ enlarged liver, spleen, kidneys (6)
- ◆ increase in white muscle disease (7)
- ◆ hoof problems (6)

- ◆ death - sudden (10)
- ◆ stomach aches (10)
- ◆ lethargy (10)
- ◆ shortened life span (23)
- ◆ effects on udders (health) (23)
- ◆ heart conditions (56)
- ◆ hemophilia (56)
- ◆ feeder cattle going off feed (62)
- ◆ cows didn't strain when calving (84)
- ◆ blindness from gas eye (94)
- ◆ water contamination (94)
- ◆ inability to absorb nutrients and vitamins from food
- ◆ pneumonia (100)
- ◆ energy deficient (106)
- ◆ uterine infections and retained placentas (125)

Respondents were given the opportunity to provide additional comments regarding effects. A summary of these comments can be found in Table 20.

#### 2.1.5 Question 5: CONDITIONS

**Survey Question:** *In your experience, which of the conditions below have contributed to air pollution impacts on animal health?*

The accuracy of these results is limited by the inconsistency of the respondents' methods in ranking.

The results captured in the Table 9, below, are from The 30 Subset. (Two respondents answered this question instead of going to Question 6; but were NOT recorded in the empirical results below.)

TABLE 9 SUMMARY OF RESPONSES TO QUESTION 5

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
<b>Condition</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>	<b>Ranked #1</b>	<b>Ranked #2</b>	<b>Ranked #3</b>
Nearness to Emission Source	23	16%	77	1-6	15	7	0
Combined Emissions	18	12%	60	1-7	10	3	3
Type of Pollutant	18	12%	60	1-4	7	2	5
Severity of Emission	17	12%	57	1-5	13	2	0
Wind Direction	17	12%	57	1-8	8	3	3
Inversions	11	8%	37	1-5	7	1	1
Weather	10	7%	33	1-9	1	3	1
Age - Animal Less than 1 Year Old	9	6%	30	1-6	5	0	3
Time of Year	9	6%	30	1-7	4	1	0

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<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
<b>Condition</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>	<b>Ranked #1</b>	<b>Ranked #2</b>	<b>Ranked #3</b>
Age - Animal Over 1 Year Old	6	4%	20	1-5	1	1	2
Breeding Cycle	4	3%	13	1-3	2	1	1
Time of Day	1	1%	3	1-1	1	0	0
Other 1	2	1%					
<b>TOTAL:</b>	<b>145</b>	<b>100%</b>					

- A. Condition - conditions (12) listed in Question 5 of survey*
- B. # of Times Selected - number of times the 30 respondents selected condition*
- C. % # of Times Selected - # of Times Selected divided by total (145)*
- D. % Ranked - percentage of respondents (out of 30) that ranked condition (# of Times Selected divided by 30)*
- E. Range of Ranking - the lowest rank and highest rank given for condition*
- F. Ranked #1 - the number of times condition was ranked as 1*
- G. Ranked #2 - the number of times condition was ranked as 2*
- H. Ranked #3 - the number of times condition was ranked as 3*

In Table 10 an arbitrary multiplier was used to weight the ranking. This was done by Table 9’s Column F “Ranked #1” being multiplied by 3, Column G “Ranked #2” being multiplied by 2, and Column H “Ranked #3” being multiplied by 1, and then summing the three totals. This was done as a way of scoring the value of the rankings. It gives a cumulative value of the rankings.

TABLE 10 RESPONDENTS RANKING OF CONDITIONS

<b>Condition</b>	<b>Sum of #1x3 #2x2 #3x1</b>	<b>% of Weighting</b>
Nearness to Emission Source	59	21%
Severity of Emission	43	15%
Combined Emissions	39	14%
Wind Direction	33	12%
Type of Pollutant	25	9%
Inversions	24	8%
Age - Animal Less than 1 Year Old	18	6%
Time of Year	14	5%
Weather	10	4%
Breeding Cycle	9	3%
Age - Animal Over 1 Year Old	7	2%
Time of Day	3	1%
<b>TOTAL:</b>	<b>284</b>	<b>100%</b>

The total possible score for all conditions is 284. Nearness to Emission Source scored the highest at 59 out of 284 or 21%.

For Question 5 the following conditions were also listed (survey number in brackets):

- ◆ ammonia and reduced sulfurs (6)
- ◆ constant low level exposure, worse when wind is from the west

Respondents were given the opportunity to provide additional comments regarding conditions. A summary of these comments can be found in Table 22.

### 2.1.6 Question 6: ACTIONS

**Survey Question:** *In your opinion, what actions should the Project Team consider to address the issue of air quality impacts on animal health?*

Responses to this question are summarized and contained in Section 4.0, Table 18.

### 2.1.7 Question 7: OTHER COMMENTS

**Survey Question:** *Other comments to the Animal Health Project Team*

Responses to this question are summarized and contained in Section 4.0, Table 23.

### 2.1.8 Question 8: DEMOGRAPHICS

**Survey Question:** *Please provide the following demographic information:  
 Interest: Agricultural (Type: \_\_\_\_\_), Oil and Gas, Concerned Citizen,  
 Other  
 Location: (Insert the name of your city, municipal districts, or county)*

#### 2.1.8.1 Interest

Table 11 captures the area of interest for all the survey respondents. The percentages are also shown for each area of interest and for The 30 Subset.

TABLE 11 RESPONDENTS' INTEREST\*

<b>Interest:</b>	<b># of Respondents</b>	<b>Percentage of Respondents</b>	<b># of Respondents from The 30 Subset</b>	<b>Percentage of The 30 Subset</b>
<b>Agriculture</b>	99	59%	27	71%
<b>Oil and Gas</b>	20	12%	4	11%
<b>Concerned Citizen</b>	33	20%	5	13%
<b>Other</b>	17	10%	2	5%
<b>TOTAL</b>	<b>169</b>	<b>101%</b>	<b>38</b>	<b>100%</b>

\*The number of respondents does not equal 154 or 30, respectively, as respondents were instructed to circle one or more area of interest.

#### 2.1.8.2 Location

Table 12 reflects the location of respondents. 146 responses were given.

TABLE 12 RESPONDENTS' LOCATION

<b>Location</b>	<b># of Total Respondents</b>	<b>Percentage</b>	<b># of Respondents from The 30 Subset</b>	<b>Percentage</b>
<b>Urban</b>	29	20%	2	7%
<b>Rural</b>	117	80%	28	93%
<b>TOTAL</b>	<b>146</b>	<b>100%</b>	<b>30</b>	<b>100%</b>

Another way of viewing the location and survey # (an arbitrary number given to each survey) of The 30 Subset is shown in Table 13.

TABLE 13 THE 30 SUBSET LOCATION

<b>Survey #</b>	<b>Location</b>
3	County of Wetaskiwin and MD of Brazeau (bees kept within a 60 mile circle so include both "counties")
6	Sturgeon
7	Clearwater County
10	County of Mountain View
23	Mountain View County
38	Foothills MD 31
46	Yellowhead M.D. 14
52	Big Valley
55	Ponoka #3
56	County of Ponoka #3
57	MD of Provost
59	Sturgeon County
61	MD of Brazeau
62	MD of Greenview
64	City of Red Deer
65	County of Sandhills
68	County of Red Deer
72	County of Red Deer and MD of Clearwater
75	Red Deer, SW corner
77	County of Grande Prairie
84	MD of Brazeau
94	MD of Wainwright
100	County of Mountain View
106	MD of Brazeau
117	MD of Provost
125	County of Ponoka
138	County of Lamont
139	Special Area #4
145	County of Mountain View
151	Rocky View

*2.1.8.3 Further Information*

Seventy-three respondents indicated that they would like to be kept informed about the activities of the Animal Health Project Team.

### 3.0 The 30 Subset

Further analysis was conducted on those 30 respondents who responded with “yes” to Question 3, The 30 Subset.

#### 3.1 QUESTION 1: AIR QUALITY - RESPONSES FROM THE 30 SUBSET

**Survey Question:** *How would you rate the air quality in your region? (circle one)*  
*very good good average poor very poor don't know no answer*

The 30 Subset’s rating of air quality as asked in Question 1 of the survey, is reflected in Table 14. 63% of the respondents believed air quality to be average or good, while 30% found it to be poor; 7% had no answer.

TABLE 14 THE 30 SUBSET RESPONSES TO QUESTION 1

Air Quality	Summary	Percentage
Very Good	0	0
Good	4	13
Average	15	50
Poor	9	30
Very Poor	0	0
Don't Know	0	0
No Answer	2	7
<b>TOTAL:</b>	<b>30</b>	<b>100%</b>

*Summary = respondents who answered “yes” to Question 3, ‘The 30 Subset.’*

#### 3.2 QUESTION 2: EMISSION SOURCES - RESPONSES FROM THE 30SUBSET

**Survey Question:** *What emission sources, if any, do you see affecting the current air quality in your region?*

The results of The 30 Subset’s ranking of emission sources as asked in Question 2 of the survey, is reflected in Table 15. Again, the accuracy of these results is limited by the inconsistency of the respondents’ methods of ranking.

TABLE 15 THE 30 SUBSET'S SUMMARY OF RESPONSES TO QUESTION 2

A	B	C	D	E	F	G	H
Source	# of Times Selected	% # of Times Selected	% Ranked	Range of Ranking	Ranked #1	Ranked #2	Ranked #3
Routine Flaring	24	11%	80	1-5	14	1	2
Oil and Gas Processing Plants	22	10%	73	1-5	10	6	2
Well Test Flaring	22	10%	73	1-6	10	1	4
Sour Gas Release	17	8%	57	1-6	9	4	1
Road Dust	13	6%	43	1-10	2	4	2
Vehicles	13	6%	43	1-10	2	3	2

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<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>	<b>F</b>	<b>G</b>	<b>H</b>
<b>Source</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>	<b>Ranked #1</b>	<b>Ranked #2</b>	<b>Ranked #3</b>
Spills and Leaks - Oil and Gas	12	6%	40	1-9	3	2	3
Forest fires	10	5%	33	1-8	1	1	1
Intensive Livestock Operations	9	4%	30	1-7	1	3	1
Pesticide Application	8	4%	27	1-10	1	1	2
Glycol Dehydrators	6	3%	20	1-8	4	0	1
Agricultural Dust	6	3%	20	1-6	3	0	1
Chemical Producing Industry	6	3%	20	1-9	3	1	0
Brush Burning	5	2%	17	1-6	1	1	0
Electrical Generation	4	2%	13	1-7	1	1	0
Forest Products Industry	4	2%	13	1-3	1	2	1
Garbage Burning	4	2%	13	2-8	0	1	0
Residential Heating	3	1%	10	1-7	1	0	0
Forestry Operations	3	1%	10	1-6	1	1	0
Fertilizer Application	3	1%	10	2-5	0	2	0
Waste Treatment Facilities	2	1%	7	1	2	0	0
Landfills	2	1%	7	1-9	1	0	0
Trains	2	1%	7	1-2	1	1	0
Aircraft	2	1%	7	2-11	0	1	0
Food Processing Plants	1	0.5%	3	1	0	0	1
Mining	0	0%	0	0	0	0	0
Mine Ore Processing	0	0%	0	0	0	0	0
Other 1	9	4%	30				
Other 2	2	1%	7				
<b>TOTAL:</b>	<b>214</b>	<b>99.5%*</b>					

*\*Due to rounding off to the nearest whole number, Column C's total does not equal 100%.*

*A. Emission Source - emission sources (27) listed in Question 2 of the survey*

*B. # of Times Selected - number of times the 30 respondents selected source*

*C. % # of Times Selected - # of Times Selected divided by total (214)*

*D. % Ranked - percentage of respondents (out of 30) that ranked source (# of Times Selected divided by 30)*

*E. Range of Ranking - the lowest rank and highest rank given for source*

*F. Ranked #1 - the number of times source was ranked as 1*

*G. Ranked #2 - the number of times source was ranked as 2*

*H. Ranked #3 - the number of times source was ranked as 3*

Another way of grouping the responses by The 30 Subset for Question 2 is reflected in Table 16. An emission is listed in order of the percentage of times it was selected (Column C); which is Column B divided by its total of 214. For example, the first sector listed, Oil and Gas, was selected 48% of the time by The 30 Subset, with Routine Flaring as the highest individual emission source selected. Columns D and E are consistent with the previous Table 15 to reflect continuity between tables and for easy reference to the new data shown in this table.

TABLE 16 EMISSION SOURCES IDENTIFIED BY THE 30 SUBSET

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>E</b>
<b>Source</b>	<b># of Times Selected</b>	<b>% # of Times Selected</b>	<b>% Ranked</b>	<b>Range of Ranking</b>
<b>OIL AND GAS</b>		<b>48%</b>		
Routine Flaring	24	11	80	1-5
Oil and Gas Processing Plants	22	10	73	1-5
Well Test Flaring	22	10	73	1-6
Sour Gas Release	17	8	57	1-6
Spills and Leaks - Oil and Gas	12	6	40	1-9
Glycol Dehydrators	6	3	20	1-8
<b>AGRICULTURE</b>		<b>14%</b>		
Intensive Livestock Operations	9	4	30	1-7
Pesticide Application	8	4	27	1-10
Agricultural Dust	6	3	20	1-6
Chemical Producing Industry	6	3	20	1-9
<b>VEHICLES</b>		<b>12%</b>		
Road Dust	13	6	43	1-10
Vehicles	13	6	43	1-10
<b>FOREST FIRES</b>	<b>10</b>	<b>5%</b>	<b>33</b>	<b>1-8</b>
<b>WASTE</b>		<b>4%</b>		
Garbage Burning	4	2	13	2-8
Waste Treatment Facilities	2	1	7	1
Landfills	2	1	7	1-9
<b>BRUSH BURNING</b>	5	<b>2%</b>	17	1-6
<b>ELECTRICAL GENERATION</b>	4	<b>2%</b>	13	1-7
<b>FOREST PRODUCTS INDUSTRY</b>	4	<b>2%</b>	13	1-3
<b>RESIDENTIAL HEATING</b>	3	<b>1%</b>	10	1-7
<b>FORESTRY OPERATIONS</b>	3	<b>1%</b>	10	1-6
<b>FERTILIZER APPLICATION</b>	3	<b>1%</b>	10	2-5
<b>TRAINS</b>	2	<b>1%</b>	7	1-2
<b>AIRCRAFT</b>	2	<b>1%</b>	7	2-11
<b>FOOD PROCESSING PLANTS</b>	1	<b>0.5%</b>	3	1
<b>MINING</b>	0	<b>0%</b>	0	0
<b>MINE ORE PROCESSING</b>	0	<b>0%</b>	0	0

Table 17 an arbitrary multiplier was used to weight the ranking. This was done by Table 15's Column F "Ranked #1" being multiplied by 3, Column G "Ranked #2" being multiplied by 2, and Column H "Ranked #3" being multiplied by 1, and then summing the three totals. This was done as a way of scoring the value of the rankings. It gives a cumulative value of the rankings.

TABLE 17 THE 30 SUBSET’S RESPONSE TO EMISSION SOURCES

Source	Sum of #1x3 #2x2 #3x1	% of Weighting
<b>OIL AND GAS</b>	<b>191</b>	<b>60%</b>
Routine Flaring	46	
Oil and Gas Processing Plants	44	
Sour Gas Release	36	
Well Test Flaring	36	
Spills and Leaks - Oil and Gas	16	
Glycol Dehydrators	13	
<b>AGRICULTURE</b>	<b>38</b>	<b>12%</b>
Chemical Producing Industry	11	
Intensive Livestock Operations	10	
Agricultural Dust	10	
Pesticide Application	7	
<b>VEHICLES</b>	<b>30</b>	<b>9%</b>
Road Dust	16	
Vehicles	14	
<b>FOREST PRODUCTS INDUSTRY</b>	<b>10</b>	<b>3%</b>
<b>WASTE</b>	<b>11</b>	<b>3%</b>
Waste Treatment Facilities	6	
Garbage Burning	2	
Landfills	3	
<b>FOREST FIRES</b>	<b>6</b>	<b>2%</b>
<b>BRUSH BURNING</b>	<b>5</b>	<b>2%</b>
<b>ELECTRICAL GENERATION</b>	<b>5</b>	<b>2%</b>
<b>FORESTRY OPERATIONS</b>	<b>5</b>	<b>2%</b>
<b>TRAINS</b>	<b>5</b>	<b>2%</b>
<b>FERTILIZER APPLICATION</b>	<b>4</b>	<b>1%</b>
<b>RESIDENTIAL HEATING</b>	<b>3</b>	<b>1%</b>
<b>AIRCRAFT</b>	<b>2</b>	<b>1%</b>
<b>FOOD PROCESSING PLANTS</b>	<b>2</b>	<b>1%</b>
<b>MINING</b>	<b>0</b>	<b>0%</b>
<b>MINE ORE PROCESSING</b>	<b>0</b>	<b>0%</b>
<b>TOTAL:</b>	<b>317</b>	<b>101%*</b>

\* Due to rounding off to the nearest whole number, the % of Weighting does not equal 100%.

The total possible score for all conditions is 317. The Oil and Gas category scored highest at 191 out of 317 or 60%.

## 4.0 PART B: WRITTEN RESPONSES

Throughout this section of the report, the written responses given by The 30 Subset (those respondents who answered “yes” to Question 3) are listed in order at the beginning of each table. They are then followed by the 124 “no,” “don’t know,” or “no answer” respondents to Question 3.

The verbatim written responses from Questions 2, 4, 5, 6, and 7 have been reorganized to respond to the appropriate question asked in the survey. If the respondent provided information that was more applicable to another question it has been moved accordingly. When a comment applied to more than one subject, it was included in both. This was done so that the information given by respondents is more accurately reflected in the appropriate topic area.

### 4.1 SUMMARY OF WRITTEN RESPONSES BY QUESTION

#### 4.1.1 Question 6: ACTIONS TO CONSIDER

**Survey Question:** *In your opinion, what actions should the Project Team consider to address the issue of air quality impacts on animal health?*

This question was asked to all survey respondents (regardless of their response to Question 3). Table 18 incorporates the written responses regarding actions to consider for the AHPT regardless of where the written comment was made within the survey.

TABLE 18 ACTIONS TO CONSIDER - WRITTEN RESPONSES

Survey	ACTIONS
6	-Review ACC Petrochemical Survey Results, Nov. 1, 1992 be reviewed by Marjorie Mann. -Alberta farmers, particularly those with livestock, who have been negatively affected by pollution, number in the hundreds. They need a forum to get that message out in a positive way. Workshops such as Edmonton 1986, Red Deer 1997, Sundre 1999, were a start. The next step should be a more inclusive venue.
7	-Make recommendations to reduce emissions -Set up a system to collect data including observational info from farmers and encourage farmers to record data/observations and submit it -Recommend better monitoring especially exposure monitoring of mixtures of chemicals -Recommend more research including toxicological research
10	-Air quality must be improved in Alberta so that emissions do not affect animals and our health. We must choose between agriculture or industry emissions.

Survey	ACTIONS
23	<ul style="list-style-type: none"> <li>-Pursue tougher guidelines</li> <li>-Ensure credible studies are done, past and present</li> <li>-Push for quicker action</li> <li>-Encourage site-specific investigations</li> <li>-Encourage the use of toxicology in investigating animal health</li> <li>-Encourage use of professionals who farmers trust</li> <li>-Find ways to communicate with livestock owners</li> </ul>
46	<ul style="list-style-type: none"> <li>-Well planned documented research</li> <li>-Air monitors that detect ALL chemicals/compounds and record on a paper or computer to determine all PEAKS of H<sub>2</sub>S, SO<sub>2</sub>, and identify combinations including BTEXs. Correlation of this monitoring information with reported health problems. It is my opinion that the "chemical cocktails" will be identified as the greatest impact sources. Averaging of emissions is useless in at least H<sub>2</sub>S and SO<sub>2</sub> releases. Peaks are the markers. More identification of compounds in ALL exposures is necessary to determine volatility of mixtures.</li> <li>-How will the livestock for monitoring/research be identified for participation in this project? Will producers who have previously claimed damage caused by "air quality" be included in this project? Will veterinarians be consulted to help identify problems within their areas? Will the public be allowed any further input (beyond this questionnaire)?</li> <li>-**I would appreciate a reply to these questions...thankyou in advance for your consideration!</li> </ul>
52	<ul style="list-style-type: none"> <li>-Supervision of stack emissions on an ongoing basis</li> </ul>
55	<ul style="list-style-type: none"> <li>-Dr. Temple Grandin has many good suggestions about feedlot conditions..</li> <li>-Plant more trees to improve air quality.</li> <li>-Manure should be injected at spreading time. I work my manure into the field the same day as my feed lot pens and sheds are cleaned.</li> <li>-Feeding manure back to the cattle after heating should be outlawed as the animals body tissue absorbs the antibiotics and chemicals in the feed and plants which is passed on to the public when they eat the beef. Feeding of chickens eyes, blood, and other parts should also be eliminated</li> </ul>
56	<ul style="list-style-type: none"> <li>-The small gas plants emissions should be at the same percentage as the big plants.</li> <li>-More pressure should be put on well site flaring (5000+ in Alberta) and piped to plants that can scrub the gas and the gas put to use.</li> <li>-Lobby the Alberta government to hire good reliable inspectors to monitor pollutants (sulphur, mercury, lead) industry's emissions; that could also include agriculture.</li> </ul>
57	<ul style="list-style-type: none"> <li>-California emission standards should be considered.</li> <li>-Use fuel cell buses. There are also other alternatives available.</li> <li>-Marginal sour gas wells should be abandoned.</li> <li>-There should be no flaring, sour gas should be returned underground.</li> </ul>
59	<ul style="list-style-type: none"> <li>-I think that all concerned must get the point across to gas and oil companies that they should certainly operate these projects at a profit for their stakeholders but they must keep the operations clean. No polluting the solids, the air, or water sources. -The consumer must also accept that he/she must help to pay for keeping these operations clean. The payment is done through higher product costs.</li> <li>-Hire team leaders who can creatively work on these very necessary projects.</li> <li>-Fundraising is also encouraged.</li> <li>-Keep up the good work.</li> </ul>

Survey	ACTIONS
61	-We feel strongly that this area should be monitored at all times and studies made regarding exposure to even small amounts of gases day and night. -24 hour (continuous) monitoring to 1 billion of a percent, as long time residing odours are also damaging our livestock and persons. -Take measures to keep air quality at a clean level. -A complete analysis of all chemicals and gases should be a prerequisite for all waste treatment facilities.
64	-Acknowledge that a problem exists.
65	-Air quality should be tested or monitored.
68	-Have independent quality testing of air and water where applicable. Certainly not by the company that may be the culprit. -Much heavier penalties for violation. -Possibly raising standards with less time allowed to up-grade facilities.
72	-We need to know exactly how the various gas cocktail emissions affect the health and productivity of livestock. That point was already made very clear at the oil industry-cattle industry workshop held in Red Deer a few years ago.
75	-Stop pollution, i.e. flaring. Even though the oil companies are under the acceptable limits, there should be NO acceptable limits for benzene as it is still damaging (at present limits) and therefore unacceptable to all of us who are suffering from pollution effects.
77	-Must be more honest testing and monitoring of air pollution. Do testing in correct location and inform the landowners so they can cooperate with the team. -Respond to the complaints in very prompt manner, not two weeks to a month later. -It would be nice to know how and what the project team has proposed to do at this time and maybe we could have some comments.
84	-See Clean Air Strategic Alliance Animal Health Workshop proceedings, Nov 29-30, 1999, Sundre, AB pages 69-70. High Tech monitoring was virtually non-existent so we have no idea what our livestock was subjected to in all 3 incidences. -If industry and govt want credibility put back in the system we are long overdue spending money on high tech continuous monitoring. So anyone wanting to know what their livestock, crops and themselves are being subjected to can have a monitor in their yard 24 hours a day 365 days a year if necessary. Monitors that start recording 1 ppm are totally inadequate to protect public health, livestock or crops. -Use high tech continuous (not passive) monitoring (monitoring in PPB).
94	-They should get rid of all flaring and prevent other harmful gas released that are let into the air from testing wells.
100	-Reduce the emissions from all gas plants and sour gas well facilities to zero. -We should be using ethanol with our gasoline in our automobiles. -The oil and gas industry should recognize the problem of SO2 emissions making already low pH soils even less productive and give help financially to rectify this problem.
106	-More monitoring of disposal areas and of larger sour gas facilities. -Get better testing of all emissions from flare stacks not just around outer edge of stack like it is now.
117	-Further investigation into areas where industrial activity is obviously affecting the performance and health of animals.
125	-More research on the connection between petrochemical emissions and on clinical and sub clinical animal health problems. These investigations should also include human health issues. The results should be released to public without being modified by stakeholders. Obviously this research should be independent of the major stakeholders. This would be an unusual process in Alberta.
138	-Assemble empirical data to make comparisons between herds which are not in close proximity to industrial pollutants and those which are.
139	-Flaring of any kind needs to stop. Not only for the animals' health but ours too.

Survey	ACTIONS
145	<ul style="list-style-type: none"> <li>-Air sampling over long period.</li> <li>-Forage and crop sampling from similar growing and soil conditions but dividing samples by those in intensive petroleum production and those far enough away to be free of industry pollutants.</li> </ul>
151	<ul style="list-style-type: none"> <li>-Link with "provincial" studies, Provide advice to Provincial Study Team</li> </ul>
1	<ul style="list-style-type: none"> <li>-encourage a wholistic/holistic approach that could identify win-win opportunities,</li> <li>-such as situations where bio-gas from animal waste combined with flared gas volumes may be sufficient to allow gathering and compressing or microturbine generation.</li> <li>-Actions with multiple benefits</li> <li>-such as improved handling of animal waste that would: reduce odor; reduce methane emissions (and perhaps even harness them for microturbine generation); reduce water contamination (improved health through better quality drinking water and also reduced pollution in general); and general improved sanitation and living conditions for livestock (especially in feedlots and other tight enclosures).</li> <li>-Also, with all parties, ag and pet. industry in particular in the room, it is an ideal opportunity for synergy identification</li> <li>-such as: harnessing flare gas to provide heat for farm buildings, gas lamps for illumination of farm yards and feedlots, or even just to keep water supply thawed (such as in a dugout).</li> <li>-Ensuring any land taken out of ag. production for use of oil and gas industry is put to best use,</li> <li>-such as: new access roads are situated to address farm as well as oil and gas needs; corners of drilling site may be ideal for grain storage bins; etc.</li> </ul>
2	<ul style="list-style-type: none"> <li>-Continue to monitor what is happening and make suggestions.</li> </ul>
4	<ul style="list-style-type: none"> <li>-Establish defensible epidemiological methods to a number of well designed prospective (and possibly case-control retrospective) studies, in order to create data that is difficult to dispute, otherwise the information becomes the issue NOT the health of animals.</li> </ul>
5	<ul style="list-style-type: none"> <li>-Data gathering re: air quality impacts on animal health</li> <li>-Commissioning/pursuing studies to obtain relevant data where there are gaps</li> </ul>
8	<ul style="list-style-type: none"> <li>-The project team should consider local actions. Any air quality impacts on animal health if exist would be localized. This is a local air quality issue.</li> <li>-Animal breeding would have impacts on the air quality. The project team should consider this issue also.</li> </ul>
9	<ul style="list-style-type: none"> <li>-Monitoring (especially related to specific situations, e.g. flaring, acidifying emissions, etc.)</li> </ul>
11	<ul style="list-style-type: none"> <li>-Make people aware of the risks and costs of cleaning up our air and soil because of our short sighted need to exploit our resources for short term gain.</li> </ul>
12	<ul style="list-style-type: none"> <li>-Continue Shell Caroline Cattle Study</li> <li>-Reach a conclusion and provide info to all interested parties</li> </ul>
13	<ul style="list-style-type: none"> <li>-Proper monitoring to get good information to see if there are any problems</li> <li>-Test animals which have been said to be affected to see what's wrong.</li> </ul>
14	<ul style="list-style-type: none"> <li>-Cumulative effects of all emissions; particulates (PM 2.5) and ozone</li> </ul>
15	<ul style="list-style-type: none"> <li>-What happened to last animal health study (750 pages).</li> </ul>

Survey	ACTIONS
16	-Where effects on health are demonstrated or strongly suspected, emissions should be subject to stricter controls -Consider animal health, human health, and ecosystem health together in many cases; benefit of reduced emissions is greater -More epidemiological studies on relationship between pollution and animal health are needed -Animal exposure needs to be better quantified -Determine effects of background and anthropogenic (?) sources of pollutants -What about effects of agricultural chemicals on animal health?
17	-Search for clear unbiased research done in other countries which may be applicable to our situation in Alberta -Look for innovative ways to shift burden of proof to industry, i.e. have industry prove animals' health problems are NOT related to air quality
18	-Better control methods on liquid manure disposal from intensified livestock operations
19	-Address sour gas as it could become excessive and be even worse in the future
25	-Reduce number of animals, they pollute.
26	-Better ventilation systems, possibly with the addition of oxygen, in the slaughter houses
27	-Do long term (5 years) monitoring around and downwind of problem areas. -Do high quality animal autopsy if required, collecting abundant scientific data.
31	-Attempt to gather further statistics in sour gas areas, in sweet gas areas, and in areas where there is no production and compare the three. Do this over a period of say 5 to 10 years. -There are radicals, who report on a somewhat exaggerated basis, in oil and gas and in agriculture. Must ensure that such half truths or even less truth than half are factored out of information provided; a difficult task. Most statistics indicate that approx. 10% is in this category.
32	-Agree on main cause and eliminate
34	-Regarding flaring, surely there is a better way than burning a valuable resource and spewing pollutants into the atmosphere. -Is anyone monitoring what is going on? There should be.
35	-Limit intensive livestock operations in residential areas
37	-Address harmful effects and wasteful practice of gas well flaring
40	-Stay close to the proposed research study and try to make sure that the proper scientific question is being asked. It's important that the question being addressed by research is focussed and "simple" enough that it has a reasonable chance of a scientifically sound answer.
41	-Ensure that analysis of suspicious cases is done ASAP
42	-Oil/gas on dairy cattle
44	-Find out for sure if the air is causing the problem some people claim. If it is proven that pollution is causing the problem then recommend changes to stop the problem.
45	-Monitoring (often) of animals by vets; not only when they are severely ill or dead, but even annually, or after severe exposure (e.g. after a well blow out). Perhaps there are hemoglobin, white blood count, electrolytes, absorption of minerals to bone which can be done to indicated possible effects. Depending on how automated animal tests are, large scale testing could be costly.
47	-Keep monitoring, especially near oil and gas plants
48	-Monitor stack outputs more vigilantly.

Survey	ACTIONS
49	-Start to do some better record keeping on incidents or times when the supposed "event" of impaired animal health occurs (i.e. wind speed and direction, ambient temperature, activities occurring in the area (industrial), odours noticed, etc.). Relying on anecdotal information after the fact does not allow regulators to look at the situation in any great detail.
50	-More study has to be done to determine the status of animal health before and after an oilfield development. Oil companies will state that there is no scientific proof that a health problem is related to their development but if everything was fine before and it isn't afterward there has to be a connection even if they cannot "scientifically prove" the connection. -Take a broad pragmatic approach to your work and don't let the "experts" let you get bogged down in scientific detail because you won't get anywhere. Many answers are plain common sense that may not be able to be scientifically proven.
51	-MUCH more attention needs to be given to OIL INDUSTRY'S effect on air quality.
60	-Gather data from other locations, as to what things/substances cause problems. Then look at our own locations in Alberta, to see if similar issues are likely, given the concentration and duration of "episodes," of various pollutants. It would seem to me that whatever we would see here in Alberta, would have been experienced elsewhere too? -Don't become a cause in search of data! Let the symptoms come to you.
66	-MAKE industry clean up and enforce laws that already exist. -Make Calgary slow its growth or better yet cap or stop it, because it is too unhealthy for all.
67	-Research alternatives for fertilizer and pesticide applications. -Awareness campaigns
69	-Animal is higher up in the food chain. We should start with ambient air quality, then vegetation studies before worrying about animal health. Animals today contain antibiotics and other medication so air quality may or may not be related to animal health.
70	-Should examine effects of chronic low level exposure to air emissions from oil and gas processing industry. -Should examine effects of intermittent, acute levels of emissions from upset and well testing conditions -Should examine aspects that effect health of animals from other factors...farm practices; antibiotics use; water/feed pathways; to determine possible confounding factors and determine relative importance of air quality on animal health. -AHPT should carefully consider blind and double blind testing approaches, and include academic review of findings. -AHPT should work with farmers and agricultural users to determine how best to COMMUNICATE the findings of the project team.
74	-Would like to see smaller pig and cattle feed lot operations, than the bigger, fewer operations. Bigger is not always better.
78	-Up until now it has been the sole responsibility of the adjacent landowners/dwellers to deal with the dust problem. This should change, the onus should be placed on the industries, municipalities, governments, etc to deal with the problem THEY have created.
81	-Should look at effects on animal health by proximity to the facilities and also wind direction (predominant).
82	-Increased use of "wood chippers" would be preferred (over brush burning) especially near rural residential areas. -A survey of farms, region by region would be useful in determining the extent of any potential problems, their nature, and where these air quality problems might be. -As well, risk assessment needs to be developed area by area. For example, air quality in Edson is affected by 25 gas plants/wells, 1 OSB plant and a major highway #16. The cumulative volumes of all these emissions needs to be known.
83	-Support the completion of the Western Canada Livestock study -Please do not blow this concern out of proportion. Remember what Mad Cow disease did to England.

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Survey	ACTIONS
85	-Put more monitor stations at various sites so that we understand what is really being emitted.
86	-First priority: much more monitoring. Unless good monitoring data is made available, this project will never be of much use except politically. Second priority: decide what else is necessary after monitoring data has been collected and analyzed
88	-How about humans?
91	-Studies that determine the long term exposure values.
92	-Consider oil and gas sour gas plant flaring...which is already being addressed as a result of CASA project team.
98	-Work to develop: substantive, credible and defensible scientific research to demonstrate what, if any, links there are between animal health and air quality. To be credible the study must move beyond anecdotal evidence of impacts and attempt to show clear cause and effect linkages. -After monitoring: This will require the concurrent, and perhaps long-term, monitoring of animal health AND air quality in a given area. -The team should also be prepared to suggest management options/management framework to mitigate any identified impacts. Management plans must be developed in consultation with all impacted stakeholders.
99	-Coordinate and help fund between the government and the petroleum industry...the impacts of flaring on animal health. The Environment Centre at Vegreville under Dr. Bob Coppock has already done some research in this area and has now a need to proceed to the next level on the impacts on animal health but as usual, funding is the problem. We need to have the science to verify and understand impacts. At present the science is not complete, so there always will be an antagonism between the energy industry and the livestock industry. -The joint project between Alberta Cattle Commission, the Petroleum Industry and Alberta Agriculture to co-fund Dr. Cheryl Waldner as an Animal Health Investigator is an interim process that needs to be maintained until the science is completed in this area. Alberta Environment needs to help fund this initiative which is near the end of its term. This process has helped mitigate potential public relations problems for Alberta in general. Dr. Waldner's expertise in epidemiology adds the credibility required for this important position. CASA should consider co-funding and taking a lead in this area.
102	-If the air is unhealthy for animals it is unhealthy for people...clean up the air.
103	-We need sufficient monitoring of air with devices. -Veterinarians may need to do more in-depth studies and on-going monitoring.
104	-Measure the actual amount of pollution in the air at various livestock operations. Look at all variables (nutrition, vaccination, and treatment protocol, etc.) but attempt to compare health status between similar operations dealing with different levels of pollutants. Research involving University of Alberta, Lacombe, or Lethbridge
108	-There are many studies already done on animal health in polluted areas. I hope you study them also. -Perhaps inventors could find a way of removing sulfur from small plants. The usual large sulfur recovery plants usually are too costly for smaller sources of H <sub>2</sub> S or SO <sub>2</sub> wells.
109	-Join the GreenPeace movement
110	-Do the proper testing to record the actual air quality to separate fact from fiction
111	-This focuses on animal health, what about HUMAN health? Document CANCERS IN HUMANS and (cancer type) by AREA. Regarding ANIMALS, maybe they get cancer too and that's what is making us sick? Can you document cancer in ANIMALS? Are they in an upswing? Are CANCERS in the upswing?
112	-Studies to determine impact of various mixtures on animal health; not just from oil and gas industry, but from transportation and agriculture (fertilizer, herbicide, pesticide, etc.)

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Survey	ACTIONS
114	-Do not turn into another special interest group...in some instances well paid, whose sole interest seems to be to shut everything down, period! -"If you want to live...don't breathe" I might remind you...and I am old enough to well remember the horse and buggy era...that the air following a horse was not always pristine and unpolluted!
119	-Consider publishing survey results for animal producers to compare their region or locality to others. If there appears to be a problem, legislation should be put into effect that would make offending parties responsible for the health of animals.
122	-Limits on size of operations (feedlots, packing plants, well sites, etc.) and the distance between operations.
124	-Consistent monitoring of animals in 2-3 areas looking at feed, local environmental considerations, and breed. Results and finding should be conclusive, documented, reported and a follow up step approach to resolve the issue or problem. When considering feed, need to ensure we understand what sprays, fertilizers, processing has transgressed with the making of the feed.
126	-Do not allow flaring under any circumstances.
127	-ENCOURAGE those with livestock to (and how to) protect our water and air.
130	-When reviewing the issue keep an open mind and incorporate animal management practices along air quality issues. In short, consider as many issues (that may cause concern) to quantify animal health.
131	-Cease or monitor flaring of any kind. -Cease all dumping of effluent into rivers from pulp plants, etc.
134	-If existing gas wells are in an area and people move in later, people then should not complain. It's like people moving out into the country to an acreage and then getting together and complaining that their neighborhood smells like a farm. If you have farms and people in an area first, then gas and oil companies should go elsewhere or buy them out at a premium before drilling, etc.
136	-Consider strategies for emission reduction in all sectors. -Study how emissions may affect plants and plant growth and how that in turn can affect the animals that utilize those plants. (Disease and growth reduction).
140	-The air quality in large feed lots, hog barns and chicken or poultry facilities should be monitored and air quality guidelines established. -Set goals and time deadline so that projects from committee planning to research projects in reasonable time intervals.
144	-Do the database and monitor
146	-More care with gas flaring -More care with spray drifting.
148	-Continuous observations.

Survey	ACTIONS
149	<p>-Collect animal health data, especially event based problems, and subject the data to rigorous quality control so as to make the data as consistent as possible. The data should be mapped spatially (geographically) and in a time series. Potential causes including air emissions, air quality events, meteorology events, etc. should be mapped against the data to find any statistical relationships. Any strong relationships found should be considered for follow up, and these could include non-air quality issues. The animal health/air quality relationship can only be properly evaluated within the context of all the major factors which affect animal health; and animal husbandry (farm practices) is the most obvious factor which should be addressed first. Animal health events should also include rigorous assessment of animal husbandry practices wed on subject animals.</p> <p>-It seems to me that the AHPT has a very significant challenge ahead of it. It's not unlike human health and air quality impacts. There are many important factors affecting animal health, with the most important related to "lifestyle", e.g. feed quality, husbanding practices, etc. -Air quality may be more important for susceptible animals which are already stressed from other factors. -Very rigorous data treatment will be essential if the group is to produce credible and scientifically defensible results. -The AHPT should consider the merits of a broadscale evaluation (across the province) versus a regional approach where intensive data collection is carried out and rigorous evaluation of data is used to identify potentially important relationships.</p>
150	<p>-Nothing for external sources...most animal/air quality problems are in confinement housing situations and are related to ventilation. If outside air is adequate for optimum human health...children and pregnant women included...it is ok for animals.</p> <p>-A better education campaign on how well animals (production animals) are taken care of. The public has very little understanding of the situation and tend to believe Green Peace and David Suzuki.</p>
152	<p>-Task force to examine and evaluate all the information available, to assess the scientific data, and to formulate objectives.</p>
154	<p>-Ban all herbicides and pesticides this will solve the problem.</p>

4.1.2 Question 2: ADDITIONAL COMMENTS

Written comments that respondents made regarding emission sources are reflected below in Table 19.

TABLE 19 EMISSION SOURCES - WRITTEN RESPONSES

Survey	SOURCES
10	-pesticide application in season -seasonal affects: more gas/oil emission activity in winter; combinations of agricultural and gas/oil in spring and summer -where is your agency? What is it doing?
46	-I believe oil/gas industry operations are the most significant polluters in this area.
55	- problem when the wind if from the northwest. We are 3 miles from the nearest feed lots.
56	-watercrafts, lawn mowers, dirt bikes, skidoos, vehicles and idling diesels.
57	-There are too many sour gas flares in the area.
59	-vehicles: tractors -sludge (human fecal waste) from cities is splashed on roads; material cleaned up by the county's grader which moved the stuff around on the road. Tractors leaving fields had sludge on their tires. First crop taken off those fields was shipped as cattle feed and dairy cattle feed.
61	-sometimes air quality is very poor due to vehicles....trucking. - waste treatment facility combined with sludge farming.
62	-Pulp mill emissions may also play an additional role in animal health effects..
65	-Many potato farmers use aircraft to spray around here.
139	-Routine flaring is a problem in our area.
12	-fertilizer application-manure
13	-probably smoking cigarettes or barbecuing steaks is a problem for people
14	-In regards to Question 1: I do not know what the air quality can be or should be in my region. I do not know what to compare it (air quality in my region) to.
25	-very good air quality 90% of the time, very poor air quality 10% of the time from offensive cattle odors -live beside [local] operation which often produces a very offensive odor.
30	-[This respondent attached two letters she wrote to Ken Kowalski, MLA, on two separate occasions regarding the burning of swamp land by farmers which results in death on highways due to low visibility. Also, this burning causes severe health problems for people with lung problems or asthma. The smoldering of the swampland can last all winter]
34	-I am really disturbed to see all the flaring that goes unchecked 24 hours a day.
37	-intensified livestock operations-hogs -have no livestock!
40	-pesticide - do you mean "herbicide"? -I live in Calgary, the difficulty in answering 1 and 2 is that the air quality ranges from excellent to very poor depending on atmospheric conditions. Most of the time it is very good.
41	[re: Question 1 - average and poor were circled]

Survey	SOURCES
45	-the things I ranked are those that cause me the most agony but I expect livestock suffer from oil and gas, overcrowding and smoke as well. - Comments on the list: forest fires: just at the moment are causing major nose/lung problems, road dust: depends on dryness just now it's higher than a 6 ranking, agricultural dust: periodic problem, sour gas release: this is a periodic problem, oil and gas processing plants: a major source but not in Red Deer city, intensive livestock operations: periodic, trains: yards close to me and diesels sometimes idle all night, residential heating: especially fireplaces, vehicles: during inversions this ranks higher, well test flaring: hasn't happened since I've been in Red Deer, pesticide application: periodic problems are serious especially at spraying, chemical producing industry: hard to differentiate this from oil and gas sometimes. -I am severely affected by H2S and SO2 irregardless of source. -Blowing dust and anything stirring up particulates is very bad, also I have multiple allergies. -Where I live the building design is very poor and indoor pollution is often poor. Sometimes have to use 2 air cleaners and wear a hospital mask to breathe.
51	- re: road dust...soil blowing in spring and fall and in winter "no snow" -re: intensive livestock operations: VERY specific places (not a problem)
54	-the way I have rated things are sort of the more obvious however in reality they maybe should be reversed as we are probably the larger polluters than industry.
66	-re: garbage burning: [local] landfill does this -re: food processing plant...[local] plant smells toxic and disgusting -air pollution and smoke from other areas of the province comes with wind and air currents, especially from fires and from the City of Calgary. The brown haze follows the river and you can see it very clearly many days. -The petro-chemical plants in west and central Alberta have created an obvious haze which is obviously pollution.
70	-Main sources in urban setting of Edmonton are vehicle emissions, road dust, and residential heating. -During upset conditions oil and gas companies, chemical producing, and forest fire events are intermittent sources of significance.
71	-re: intensified livestock operations...hogs
74	-we live in an agricultural area, but there are several gas and oil wells here also. -My concern is regarding the BIG pig and cattle feed lot operations.
78	-re: Question 1 average and poor were circled. -It is interesting that with the dramatic increase in heavy truck traffic in the last several years, be it oil industry, grain movement, etc. that no attention is being given to road dusts effects on not only animal health but human health. As can be seen by the attached photo [in the AHPT Survey file] there are some days you just do not want to go outside to perform duties required by our occupations or let children play. Road access and travel become very dangerous for the lack of visibility.
79	[-re: Question 1: very good and good were circled]
81	-We aren't affected by any of these. We have none close by.
82	-Brush burning above refers to [local] forestry plant practice of burning brush piles about a year after an area has been cut. The smoke from this type of burning can last 2 to 4 weeks.
85	-Any of the above emission sources are not really bothersome.
89	- re: Intensive Livestock Operations...hogs -We live near a Hutterite Colony
90	-re: vehicles...including tractors"
92	-re: vehicles..."transportation"
93	-No industry in this area. Road dust from through- traffic is a big concern.
96	-forest products industry: burning of waste wood producing fly ash.
102	-Items ranked 3 (vehicles) and 4 (forest fires) are very minor

Survey	SOURCES
103	-It is hard to rate these conditions on a 1-2-3 order; as one will be more intense at a certain time of the year. There's more pollution during the summer months.
108	-Live in town of Sedgewick, no pollution noticeable however I know there is SO2 dust falling from burning flares from gas processing. Also fallout from [local] coal fired electrical plant. I am several miles from a liquid manure pig lagoon.
109	-I think politicians cause most of our problems.
114	-Ah, come on now, you can't eliminate everything...Road Dust? Agricultural Dust? Brush burning? Garbage burning? How do you eliminate forest fires, volcano eruptions, etc. etc.
116	-We are getting the storm sewer runoff from three [local] municipalities through our farm.
123	-My concern is human health! I live beside a very busy secondary highway. Our water supply is from dugouts. All summer we are subjected to extreme road dust. The County of Saddle Hill has discontinued dust suppression.
127	-If any should be ranked it's only for such short times. Out on farms there's lots of fresh air.
132	-The oil and gas industry is the biggest culprit for destroying our air quality.
133	-We are out in the country. We do not have much pollution as such. The ones I indicate are only very short time span.
134	-We get predominantly west, northwest, and southeast winds here. Air quality is quite good. However, a proposed sour gas well four miles directly west of here is not going to keep air quality at this level.
137	-You need to come to the oil and gas plants in the golden spike area; lots of smell from [local] oil and gas plant and [local] utilities plant.
143	-I am concerned with impact [of emission sources] on humans
148	-Vehicle emissions in our urban area. On our cattle operation (rural) we seem to have had increased problems for whatever reasons we have not yet pinpointed.
149	-Question 2 should have a second part: Why do you believe this? -I live in Calgary, the air is good. However, vehicle emissions are rising and it's becoming noticeable at times in the air. Another major factor is weather, and when it's dry for a long time, dust gets bad. Construction activities in and around the city increase dust levels when it has been dry for extended periods of time.
150	-My location is just west of Calgary. The air quality is generally very good except for the odd blast from the City of Calgary when we get an east wind.

4.1.3 Question 4: ADDITIONAL COMMENTS

Description of effects was only asked of those who answered yes to Question 3 (responses are at the beginning of the table). However, those who chose to fill in written comments (even if they answered Question 3 as no, don't know, or no answer) are recorded here in Table 20. Also, when verbatim written responses were reorganized some fell under this category. This category was also expanded to include concerns.

TABLE 20 EFFECTS AND CONCERNS - WRITTEN RESPONSES

Survey	EFFECTS & CONCERNS
3	-Bees die downwind from oilwell batteries. When hives moved effect is avoided. -Concerned over what aromatic hydrocarbons are doing to our cattle herds. These pollutants are fairly common emissions at oil and gas facilities but are some what invisible to us all. Grazing livestock are often in very close quarters with those sites liberating benzenes, toluenes, etc and I worry they may be receiving a larger dose than is healthy. They are not beneficiaries of a diluted plume during their grazing around oilfield sites.
6	-Poor mothering: not very significant) -lesions ranging from skin rash to cancerous tumors the size of a basketball -bowel lesions -high incidence of abscesses, including liver -heart failures -Other key concerns are "alfalfa sickness" and hydrophobic soils. They are outside the AHPT mandate but are related.
10	-incident effects: sudden deaths of dog and cat. -horses got deathly ill; displayed symptoms of colic and became stiff-legged, laying down all the time.
23	-poor mothering after incidences such as increased flaring -Younger animals are more susceptible -experienced health conditions depending on the source, and conditions. Different conditions result in different problems.
38	-we gave selenium as cattle got white muscle (no longer have cattle) -barbed wire fences and steel bins rust quickly
46	-incident effects: 4 calves died right away, 50% cows aborted and were still open a preg-check 4 months later. Within two years had culled all cows and a bull that had been exposed.
55	-incident effects: cows took their calves and went to the far end of the field; one and half miles away from noise. -health of animals in feed lots: overcrowded, need wind breaks and bedding regularly. Too many needles and antibiotics given to offset the cruel and inhumane treatment.
56	-In the area 6 miles east of the [local] gas plant there has been many health problems in our cattle, such as white muscle disease, calf scours, abortions, deformities, fertility, respiratory, pink eyes. These problems seem to be more prevalent from the gas plant to Highway #2 getting wider farther east. These problems could also partly be caused by the increase in the number of cattle in this area. Also the use of high applications of fertilizers and pesticides could be a factor. Personally in my own operation (cow calf) when we stopped using fertilizer on our pastures and hay our scour problems were next to nothing.
59	-a MARKED increase of aggression in cattle -a small gas upgrader using amines to remove H <sub>2</sub> S(g) and the escaping amines caused severe aggressive behavior in cattle, loss of weight, poor diet (off feed), abortion (20% calf crop loss).

Survey	EFFECTS & CONCERNS
61	<p>-depending on wind direction we are subjected to a variety of bad smells often for 24 hours a day where we know some H2S and SO2 are sometimes present. - grave financial losses. -forced to take my mares away from this place in the last 3 months of gestation to avoid abortion (or the possibility thereof) and bring the mares back for foaling within a week or two of due date.</p> <p>-had to reduce our herd to a manageable size because of the extra work and cost. -on four or five occasions my mares have aborted within 2 to 3 days after a strong smell of H2S covered the area. Both local and a federal veterinarian have confirmed this to us after extensive examinations were done.</p> <p>-breed race and endurance horses and have observed that poor air quality for a number of days will always reduce their output and makes them more susceptible to cold and sniffles, etc. As the immune system fights this pollution it is only following that this energy is not available for performance.</p>
62	<p>-main problems connected with pregnancy, unthriftiness, and going off feed in feeder cattle under 1 year plus a lot of eye problems. -Cows near heavy flaring have a great deal of trouble with sandcracks (vertical cracking of hooves) that were not known before industrial activity increased in the area. Other ranchers have much similar experiences.</p>
65	<p>-We have seen a deterioration of animal health since the many wells have been dug around us with one winter of steady flaring.</p>
68	<p>-Poor soil fertility (fertilizer requirements have changed).          -The nutrition of the livestock feed produced has had to be fortified at much higher levels than previously with trace element.</p>
72	<p>-incident effects: major oil spill from fracking (some frack fluids are very toxic) operation. 25 - 30% open cows for 8-10 years. Went from 45 breeding cycle to 75 day breeding cycle. Getting more cows bred now but I am still not back to normal.          -If gas emissions affect livestock then what does it do to people?</p>
75	<p>-we feel like we have the flu, headaches, body aches, general malaise, and extreme fatigue. This has to be affecting the animals too, since we have had deformed kittens and birthing problems in cats and dogs.          -Benzene and CS2 cause over half the symptoms of fibromyalgia, which many people in this area have.          -CS2 suppresses thyroid and other hormone function, and we have cattle with large abscesses on their thyroid gland.</p>
94	<p>-had problems from 1987 until 1993 when the production facility moved away. -The cows' production from 1987 dropped from 165 BCA to 142 BCA in 1992. When the Battery was cleaned up the cows jumped to 190 BCA in six months and now have increased gradually to over 230 BCA present day.          -We have records on our farm of the animal production from 1978 to 2000. We have found that with a clean environment the animals do well. Throw oil and gas pollution into it and the worse it is the faster we will go broke.</p>
100	<p>-In an area along the eastern slopes of the Rocky Mountains there are areas that the soil is of low pH. SO2 emissions make soils less productive. Lime has to be added which is another expense for agriculture.</p>
106	<p>-strong smell of H2S which contributes to loss of appetite in cattle.</p>
108	<p>-Soil tests near Hiesler indicate sulfur build up in the soil.</p>
117	<p>-Over the past few years lower production from our beef cattle herd. -increase in aggression in our animals, which may be pollution or a change in our breeding schedule. There has not been enough change to make any definite conclusions possible.</p>

Survey	EFFECTS & CONCERNS
125	-Having worked with beef cattle in areas of world with no oil and gas activity, I observe there is a much more serious problem here with cow fertility. Feeding large amounts of selenium vit E seems to help. Even with these supplements most beef cows get culled "open" before they have reached 10 years old. -Calf respiratory problems also seem much more severe.
138	-a producing well pumping into a tank from which oil is hauled every day. There is no flaring but there is a noticeable smell from time to time. -had more (2-3 sets) twins in our herd recently and one to three abortions a year in 80-85 cows. -two completely unexplainable deaths in 2 or 3 week old calves...no previous sickness noted. Although we have noted similar occurrences in past years, they seem to have increase 2 to 3 fold in the past 3 years.
139	-went from 5-8% open cows in the fall to around 25% open cows. We semen tested our bulls and checked for venereal disease. This is expensive and hard to deal with. The only thing we could come up with were the flares in the same pasture as where they were being bred.
145	-in 1960s when 2 gas plants and numerous wells were producing we were told that our calf mortality had com from a selenium shortfall therefore white muscle disease which we now give shots for.
151	-My experience in #3 is linked to evidence (anecdotal) provided by various ranchers and not directly from my own experience.
22	-as the [local] town gets bigger its sewage will increase in quantity and if it is not made to retain its sewage in those years of heavy rainfall it will be dumping more sewage into the creek which will affect water quality all the way to Hudson Bay. The sewage is turned into the creek just as it flows into our farm [location given]. Years ago we had sick calves and we tried to fence the creek in such a way that the sewage got mixed into the water for some distance before the stock were exposed to it. After some ten days the gates were closed once more as the water level in their lagoon had receded. However, the town should be made to retain its sewage completely the year round.
43	-we have farmed around oil wells for many years and have had no problems -Many landowners are very quick to take the money from oil leases, but cry when they see bad side effects (if any).
45	-These are effects that cause me the most agony but I expect livestock suffer from oil and gas, overcrowding, and smoke as well -nose/lung problems [depending on conditions] from forest fires, road and agricultural dust, sour gas release, intensive livestock operations, residential heating, vehicles/idling, pesticide application. Also I have multiple allergies.
48	There are times on a quiet morning that we can see a long yellow haze from the [local] power plant extending for miles.
54	-Although the oil and gas industry emissions have an impact on livestock I believe the effects are short lived and have a minimal long lasting effect, i.e. in the overall beef production cycle in a cow calf operation there is negligible negative effect.
60	-While I have no doubt that air quality issues can have chronic, or even acute effects on animals, including humans, I have no evidence of any impact personally.
66	-The petro-chemical plants in west and central Alberta have created an obvious haze which is obviously pollution.
71	-Cloud emitted from the [local] petro-chemical plant's flare stacks is questionable. There have been numerous cancer deaths and sicknesses in the prevailing SE region of the wind direction from the plant. (Coincidence?) Maybe!
74	-The smell from BIG pig and cattle feed lots is bad and disposal of the manure presents a problem.
82	-Information regarding the effects of air quality on cattle has not been well documented in the Edson area. Information appears to be only available through word-of-mouth.
101	-We suspect that we have had abortions and other sickness in our cattle from emissions, but are unable to prove it
107	-I raised livestock in this area for more than 50 years and never saw any effect that air pollution could have had on any of them.

Survey	EFFECTS & CONCERNS
112	-Do not have livestock. Believe that there are many factors that have more effect on animal health than air pollution except for a specific acute episode (i.e. well blow-out, etc.)
124	-How do you consider some of the climate changes that are happening. For example, around Vermilion area (where I've got cattle) the quality of good pasture is getting worse. Also it's drier, and more wind. Also, 10-20 years ago farmers would summerfallow whereas today it's more spray/fertilizer. -I guess the question is "How do you consider all these factors when doing an animal health study?"
148	-We are aware we have problems but truly why?
149	-There are many potential affects and causes relating to animal health.
154	-high rate of cancer among farmers using herbicides. -Animals like pocket gophers roam all fields sprayed with herbicides

#### 4.1.4 Incidents from Written Responses

Table 21 captures written comments made by respondents regarding specific incidents. These written comments were taken from other sections of the survey, and this category was created.

TABLE 21 INCIDENTS FROM WRITTEN RESPONSES

Survey	INCIDENT
10	-sudden deaths of dog and cat. -horses got deathly ill; displayed symptoms of colic and became stiff-legged, laying down all the time. Evacuated the horses. -we are in the air stream of two flares that were caught on film illegally flaring. -vacated property due to H2S gases, which are still present -we are not living on our property; due to illegal flaring and water pollution! How's that for corporate responsibility!
46	- pop-off valve releasing for several hours spewed out storage tank with light condensate contaminating a pasture. Result -4 calves died right away, 50% cows aborted and were still open a preg-check 4 months later. Within two years had culled all cows and a bull that had been exposed.
55	-The vets say it looks like mineral deficiency or lack of calcium or heredity or shortage of phosphorus or sulfur or poor management last year. I feed selenium salt blocks. -When the oil companies were flaring it made so much noise that the cows took their calves and went to the far end of the field; one and half miles away. -We are 3 miles from the nearest feed lots. Run off from manure spreading is polluting the creek and lakes and local wells.
72	-major oil spill from fracking operation. 25 - 30% open cows for 8-10 years. Went from 45 breeding cycle to 75 day breeding cycle. Getting more cows bred now but I am still not back to normal.
22	- when [local] sewage field gets full, they open valves and run affluent into Willow Creek which runs right by our farm buildings.
34	-To draw attention away from flaring, one company told its operators to put out the flares and simply allow the sweet natural gas to escape into the air. Another company was compressing excess natural gas back into the formation. -Two years ago when oil prices dropped the compressor was shut down and a huge flare burned all winter because they claimed it cost too much for the electricity to run the compressor. I see that it is back in operation again now -I don't know how animal health is affected by this but I wonder about human health.

4.1.5 Question 5: ADDITIONAL COMMENTS

Comments made by The 30 Subset are listed at the beginning of the Table 22. Again, as with Table 19 and Table 20, Table 22 incorporates the reorganization of verbatim responses. It also has been expanded to include location details.

TABLE 22 CONDITIONS AND LOCATION - WRITTEN RESPONSES

Survey	CONDITIONS & LOCATION
3	-experience problems with bees when in a rather direct path of emissions from battery sites or well heads that have storage facilities or dehydrators. -either downwind of NW winds or on downhill slope below a battery there seems to be a problem in most instances.
10	-in the air stream of two flares
23	-all of these conditions are equal at different times. Different conditions result in different problems.
46	-The flares from battery sites and plants spread over different areas as a result of temperature, winds, inversions. An H2S release for example migrates to low lying areas and time for dispersion is determined by wind directions, speed, etc.
52	-air pollution from [local] refinery
56	-the types of pollutants can be a problem. Sulphur: any amount of sulphur (H2S) over 6 pounds in any given area can be detrimental to animal health. Lead and mercury in any amount. -The [local] plant cleans out its system late at night when the air is heavy and the emissions settle to the ground instead of dissipating in the air during the daylight. This [local] plant has come a long way in reducing its emissions, it's the small plants that can cause problems.
59	-this question is poorly worded...how can breeding cycle contribute to air pollution?
61	-Because of location of our farm air pollution has become a serious problem.
62	-In our case the flaring was at a distance of approx. 6 miles. Complaints re: sandcracks from ranchers near large gas cleaning plants are similar. -Pulp mill emissions may also play an additional role.
64	-There is a high correlation between proximity of emissions and incidences of animal health problems.
65	-Near emissions of large coal fired power plants, sour gas plant, and [golden spike] plant. -We have seen a deterioration of animal health since the many wells have been dug around us with one winter of steady flaring.
68	-The number of gas plants northwest and southwest of us.
72	-live 10 miles from Caroline Gas Plant -As mentioned in question 4 I had a major oil spill that affected our herd for years. I have been told that some of the frack fluids were very toxic.
75	-We live on the river flat, and those pollutants are heavier than air therefore gravitating to the river bottom. -Affected when winds are from the S or NW but particularly S.
84	-7-10 and 13-12 blowouts were severe -94 emissions were SO2 and very light -See Clean Air Strategic Alliance Animal Health Workshop proceedings, Nov 29-30, 1999.

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Survey	CONDITIONS & LOCATION
94	<p>-had problems from 1987 until 1993 when the production facility moved away.            -The animals closest to the emission source were the most effected. In the summer the milk cows were the most effected as they were next to the source. In the winter they were in the barn farther away and were not as effected. The yearling animals were the same distance away all the time and were consistently effected but to a lesser degree.</p>
100	<p>-We are located just east of Sundre and have 4 sour gas plants within a 20 mile radius also lots of sour oil wells that also have sour gas. Impacts here will be much greater than in other areas.            -With SO2 falling on low pH soils make them less productive.</p>
106	<p>-I live close to a disposal plant for sour gas and every so often if the wind blows from the northeast or we have an inversion we will get a strong smell of H2S which I feel has an effect on the cattle to the extent they lose their appetite.</p>
117	<p>-have 25-30 oil wells on the half-section where we winter our cows.</p>
125	<p>-Having worked with beef cattle in areas of world with no oil and gas activity, I observe there is a much more serious problem here with cow fertility.</p>
139	<p>-We live close to a gravel road which is a problem.            -Not only concerned with animals' health but ours too.</p>
1	<p>-live in south Edmonton so survey may not be useful</p>
18	<p>-we have no industry located in our area</p>
22	<p>-we are free of animal health problems due to poor air quality. Living next to the mountains and westerly winds prevailing our air quality is supreme.</p>
40	<p>-live in Calgary, air quality ranges from excellent to very poor depending on atmospheric conditions.</p>
50	<p>-I do not personally have an air quality problem with my livestock. -My observations come from problems I have seen develop in other parts of the province. These problems arise when a gas plant has be constructed in the area or an oil field is developed with a number of flares. If a livestock producer has had no livestock health problems until one of these developments has occurred, common sense would dictate that there has to be a connection of some kind.</p>
53	<p>-air quality varies in our area in southern Alberta. We have "Feedlot Alley" with numerous feedlots. In other areas there are many oil wells and plants. In the City of Lethbridge we have Canbra [?] Foods (seed skweezers).</p>
54	<p>-living a rather heavy oil and gas area</p>
60	<p>-I live in Stony Plain; about 30 km east of the large coal plants at Wabamun. My answers reflect this location.</p>
71	<p>-We reside three miles from a petro-chemical plant and the winds (prevailing) seldom blow from that direction (NE). The cloud that is emitted from the flare stacks is questionable. There have been numerous cancer deaths and sicknesses in the prevailing SE region of the wind direction from the plant. (Coincidence?) Maybe!</p>
108	<p>-My livestock are a long way from the gas wells and oil processing.            -Air pollution from the [local] coal produced electrical plant can be seen for many miles, often looking like a cloud. -I have been told that the cloud may be seen from airplanes all the way to Saskatchewan.</p>
149	<p>Major factor is weather, and when it's dry for a long time, dust gets bad.</p>

4.1.6 Question 7: OTHER COMMENTS

**Survey Question:** Other comments to the Animal Health Project Team

This question was asked of all respondents. Table 23 captures those comments that didn't fit into any of the other categories of written responses. Comments made by The 30 Subset are at the beginning of the table.

TABLE 23 OTHER COMMENTS - WRITTEN RESPONSES

Survey	OTHER COMMENTS
3	-One wonders what specifically was killing the bees. Perhaps honeybees are simply hypersensitive in this regard. They may, on the other hand, be like canaries in the mine and be well worth noticing.
10	-the effects of emissions on animal health have been studied to death for about 30 years. It's simple industrial and agricultural activities affect the health of everything in the environment. What more does industry need to prove they are impacting all our lives in Alberta? -where is common sense in Alberta with regard to air pollution? -what gets emitted must come back to earth as particles are heavier than air and so on
1	-Own no animals, not even pets
5	-Good luck with your work!
15	-Is this another charade that will take years to complete stone walling. -If government is going to treat this report your working on like they did the last report DON'T waste your time and taxpayers money
17	-in regards to Question 3: I don't understand why "go to Q6". Just because we are not sure if air quality has impacted on our animals' health, does not mean we are not aware of HOW air quality may impact our animals' health. -it is late in the year to try and get farmers and ranchers to consider issues like this [to complete a survey], i.e. spring seeding is about to happen
19	-some feedlots in our area are built too close to [local] town and that gives a bad name to farmers and feeders. -they shouldn't get permits to build that close to a town.
25	-If my oil and gas properties created such a smell [as local agriculture operation] I would be in deep trouble. There is definitely a perceived double standard for agriculture versus oil and gas.
26	-we "grow" animals (i.e. cattle, chickens, etc.) in order to butcher them for human consumption, yet we are concerned about the quality of air they breath? What is wrong with this picture!!!
30	-we do not have any animals, but are much interested in clean air for humans
43	-many people have moved out into the country and then expect farmers to cater to them. They have to be made aware that farming was there first, and they should not complain later. -Everyone, consumers too, must be aware how important agriculture is to our economy, and not try to stop it. It creates many, many, jobs as well as "cheap food" policy. -to some people, animals seem to be more important than people. You can legally abort babies, but if you touch baby animals, or even duck eggs (as a worker was fined for destroying a few on a golf course) you are in trouble. -"Farming is everyone's bread and butter."

Survey	OTHER COMMENTS
45	<p>-don't have any animals -I wish humans would rate higher than cattle, pigs, and chickens just for a change.</p> <p>-I have no recent experience with animals. The ranking is what causes me to feel ill and I have read a number of studies which show that younger humans/animals are at the most risk.</p> <p>-The only way to address both the human and animal health problems is to clean up the air. The technology is there to do this. Only the willpowers of government and big business is not. -Studies done by various environmental think tanks around the world have shown that in almost all cases cleaning up the air quality can result in economic savings for business and more jobs, jobs, jobs. Someone has to take the lead, of course. It requires the support of all levels of government, industry, and the citizens, which is where the problem lies. Governments in this country only get as far as studying the studies ad nauseum. As I recall Martha has been trying to convince the govt since at least 1970s.</p>
51	<p>-MUCH more attention needs to be given to OIL INDUSTRY'S effect on air quality. The STRESS on a "born farmer" when cattle abort, are way down on milk, get skinny on good feed, etc., etc., really CANNOT be compensated for by just dollars. Flares etc. should 100 in the air etc. [?]</p>
78	<p>-up until now it has been the sole responsibility of the adjacent landowners/dwellers to deal with the dust problem. I feel that this should change, that the onus should be placed on the industries, municipalities, governments, etc to deal with the problem THEY have created. That is how responsibility works in virtually every other sector. -As individuals we are simply brushed aside and told "it's not that bad" but maybe lobbying through a group such as CASA will have more of an impact.</p>
83	<p>-Please do not blow this concern out of proportion. I believe the animal health impact from emissions is very small, but the impact on the beef industry could be devastating to beef producers if a panic is caused in the world markets because we make a big deal about emissions. Remember what Mad Cow disease did to England.</p>
102	<p>-Clean air as applied to animals is not really a Town issue. -This [local] town has few domestic animals other than pets; possibly the local vet or Alberta Fish and Wildlife.</p>
127	<p>-Most people with livestock will be considerate of others to their best.</p>
137	<p>- we have no cattle - I have stated our concerns. We will watch your possible actions in the media or newspaper.</p>

# APPENDICES