

# Real-Time Air Quality Activity

## Student Sheets

## Group Sign-up Sheet Real-time Air Quality Activity

Green Group: Location (minimum 3 students)

1. \_\_\_\_\_ 3. \_\_\_\_\_ \_\_\_\_\_  
2. \_\_\_\_\_ \_\_\_\_\_ \_\_\_\_\_

Red Group: Time (minimum 4 students)

1. \_\_\_\_\_ 3. \_\_\_\_\_ \_\_\_\_\_  
2. \_\_\_\_\_ 4. \_\_\_\_\_ \_\_\_\_\_

Yellow Group: Health Effects (minimum 4 students)

1. \_\_\_\_\_ 3. \_\_\_\_\_ \_\_\_\_\_  
2. \_\_\_\_\_ 4. \_\_\_\_\_ \_\_\_\_\_

Blue Group: Weather (minimum 8 students)

1. \_\_\_\_\_ 4. \_\_\_\_\_ 7. \_\_\_\_\_  
2. \_\_\_\_\_ 5. \_\_\_\_\_ 8. \_\_\_\_\_  
3. \_\_\_\_\_ 6. \_\_\_\_\_

Brown Group: Visibility (minimum 4 students)

1. \_\_\_\_\_ 3. \_\_\_\_\_ \_\_\_\_\_  
2. \_\_\_\_\_ 4. \_\_\_\_\_ \_\_\_\_\_

## Notebook Cover Sheet

NAME:

GROUP:

MONITORING LOCATION:

ROLE:

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### NOTES

My Data is Saved at (recommend saving in 2 locations!):

I Have Entered Data for the Following Dates:

Dates for:			
Days 1-5:	Days 26-30:	Days 51-55:	Days 76-80:
Days 6-10:	Days 31-35:	Days 56-60:	Days 81-85:
Days 11-15:	Days 36-40:	Days 61-65:	Days 86-90:
Days 16-20:	Days 41-45:	Days 66-70:	Days 91-95:
Days 21-25:	Days 46-50:	Days 71-75:	Days 96-100:

## **Real-time Air Quality Notebooks Contents**

1. Cover Sheet

Must include: Name, Group, Monitoring Location, Role

2. Group Details Pages

3. Vocabulary

Once Data has been Collected:

4. Graph

Must include: proper labeling

5. Sentence/paragraph describing your graph

6. Print out of group presentation (print several slides per page, include notes)

You will be graded on the completeness of the contents, the quality & accuracy of your graphs, & the quality & accuracy of your sentence describing the graphs.

## Introduction to Excel – Student Instructions

1. Download the “Practice Spreadsheet” from the website

<http://swehsc.pharmacy.arizona.edu/coep/airexercise>

2. Enter the following data into the Carbon Monoxide spread sheet.

Day	Date	Alvernon & 22 <sup>nd</sup>	Cherry & Glenn	Children’s Park	Craycroft & 22 <sup>nd</sup>	Downtown
1	1/27/01	22	15	16	15	20
2	1/28/01	15	3	6	6	8
3	1/29/01	19	14	12	11	26
4	1/30/01	19	22	15	12	25
5	1/31/01	24	18	12	15	27

3. Calculate the average for E10, F10, and G10

To obtain the average click on the **f(x)** button at the top-center of the page ⇒ select AVERAGE ⇒ click OK ⇒ enter the first and last cell numbers you want to average separated by a colon. At the Children’s Park location that would be (E5:E9)

4. Calculate the standard deviation for D11, E11, F11, and G11.

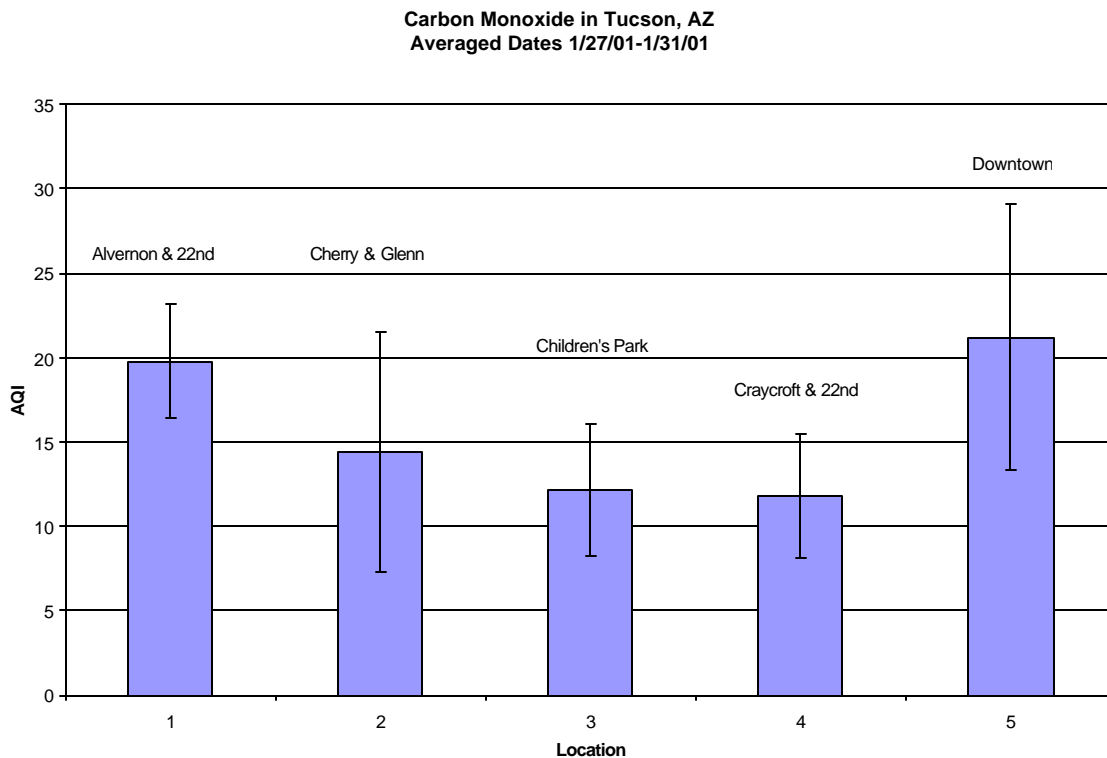
To obtain the standard deviation click on the **f(x)** ⇒ select STDEV ⇒ click OK ⇒ enter the first and last cell numbers you want to average separated by a colon. At the Cherry & Glenn location that would be (D5:D9) and at Children’s Park that would be (E5:E9).

5. Create a graph of the data.

- A. Highlight C10:G10 (averages)
- B. Click on the Chart icon OR go to “Insert” → “Chart”
- C. Under “Chart Type” highlight column, select “Next”
- D. Check to make sure the “Data Range” has the correct squares (the ones you highlighted it will look like =’carbonmonoxide’!\$C\$10:\$G\$10). Leave “Series in rows” selected.
- E. Go to the top of the window & click on the “Series” tab.
- F. In the “Name” box type in “Week in January,” select “Next.”
- G. In the “Chart Title” type in the title “Carbon Monoxide by Location.”
- H. In the “Category (X) Axis” type in “Location.”
- I. In the “Category (Y) Axis” type in “Air Quality Index.”

- J. Click "Next."
- K. Save chart "As New Sheet." And label "Chart Example."
- L. Select "finish."
- M. Now we are going to add error bars.
- N. Double click on one of the bars.
- O. A window titled "Format Data Series" should come up.
- P. Click on the tab titled "Y Error Bars."
- Q. Select "Display Both."
- R. Under "Error Amount" select "Custom" and click in the "+" field.
- S. Now go back to the "Carbon Monoxide" spread sheet by clicking on the lower left tab.
- T. Highlight the cells C11:G11 (standard deviation.).
- U. Go back to the chart. Under "Error Amount" select "Custom" and click in the "-" field.
- V. Again, go back to the "Carbon Monoxide" spread sheet and highlight the cells C11:G11 (standard deviation.). You should see the error bars on the columns.
- W. Click "OK."
- X. Next we will label the columns.
- Y. Click in the text box located just above the graph, remove any text, and type in the location for Bar 1, which is "Alvernon & 22<sup>nd</sup>." Then hit "Enter."
- Z. Move the text box above the Bar 1.
- AA. Repeat steps V & W until all the bars are labeled.

Graph should look like:



## Introduction to Statistics Activity – Student Sheet

1. Measure your height in inches and write it down (you will share this with the class).
2. Copy down the class height data below and calculate the average.

Average =

3. Hand calculate the standard deviation of three of the above heights. Use the chart below to guide you:

Sample #	Height (Inches or meters)	Deviation (measured value – average) OR (column 2 – average)	Deviation Squared (deviation X deviation) OR (column 3) <sup>2</sup>
1			
2			
3			
	Sum =		Sum of deviations =
	Average =		

**Standard Deviation (sum of deviations/n-1) =**

4. Enter all of the class heights into an Excel spreadsheet.
5. Find the average and the standard deviation using Excel. Write down your answer:

Class Average =

Standard Deviation =

## Guess & Know – Student Sheet

If you are *guessing* or *think* you know the answer, but are uncertain, then write it in the GUESS section. If you are certain about your answer, write it in the KNOW section.

**Keep this sheet in your notebook, you will need it again later.**

1. What are some common air pollutants?

GUESS:

KNOW:

2. Fill out the table.

	Carbon Monoxide		Ozone		Particulates	
	GUESS	KNOW	GUESS	KNOW	GUESS	KNOW
<b>Source(s)</b>						
<b>Health Effects</b> (refer to specific body parts or functions)						
<b>Visibility</b> (color, more/less opaque)						



## Group Details

# Green Group: Location

<b>Group Summary:</b>	<b>Roles:</b>	<b>Assignment Summary:</b>
<p>This group will compare the pollution levels for ozone (O<sub>3</sub>), carbon monoxide (CO), and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) at different locations within the city using the 8 hour Air Quality Index reports.</p>	<p>Assign roles. Each person tracks one pollutant.</p> <ol style="list-style-type: none"><li>1. Ozone Tracker</li><li>2. Carbon Monoxide Tracker</li><li>3. Particulate Tracker</li></ol> <p>If there are more than 3 people in this group, then there will be several ozone and carbon monoxide trackers (divide the locations to track)</p>	<p>Each student will enter the data into a spreadsheet for his/her pollutant for each location where it is monitored.</p>

### COLLECT DATA: Set-up (1<sup>st</sup> time)

1. Decide on each of your roles (see above).
2. Go to the activity website (<http://swehsc.pharmacy.arizona.edu/coep/airexercise>) and download the Excel spreadsheet for the “Green Group: Location.”
3. Save the spreadsheet onto your disk or computer.

## Green Group Instructions, pg. 2

### COLLECT DATA: Everytime

1. Open your saved Excel spreadsheet.
2. Go to the bottom of the spreadsheet and select your pollutant (carbon monoxide, ozone, or particulates). This will open the correct sheet.
3. Go to the activity web site and click on “Get Your Data” in the Green Group: Location Column.
4. Choose the date you need.

*Note: In order to get a full day's worth of data, you will need to view the data for the previous week day (i.e. yesterday, or if it is currently a Monday you will view Friday's data).*

5. Click on “**view**” **PSI Report text/html**. You see the locations listed.
6. Enter the date you have chosen into the “Green Group: Location” spreadsheet.
7. Enter the data for your pollutant into the spreadsheet.
8. Repeat until all the data is entered.
9. Be sure to save your worksheet!

## Green Group Instructions, pg. 3

### PRESENTATION PREP: Find Averages

1. Find the average and standard deviation for each location for your pollutant at the end of each week.
2. You will notice there are some squares with the words “#DIV/0!”. These squares already have the formula to find the average of your data. (Note: The average changes as you enter the data.)
3. You will need to enter the formula for the average for the remaining squares. There are several ways to do this – try one of each of the ways:
  - a. *Go to INSERT **F**FUNCTION **F** select AVERAGE **F** enter the first and last cell numbers you want to average separated by a colon. In the third average box that would be (E3:E7).*

OR
  - b. *Type =average(E3:E7) then hit enter. You can also highlight/select the cells you want to include.*

OR
  - c. *Select a cell that already contains an average calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells for which you want the average.*
4. You will need to find the Standard Deviation (which tells you how variable your data is or how much change there is between weekdays at the same location). There are several ways to do this – try one of each of the ways:
  - a. *go to INSERT **F**FUNCTION **F** select STDEV **F** enter the first and last cell numbers you want to average separated by a colon. In the third Standard Deviation box that would be (E3:E7).*

OR
  - b. *Type =stdev (E3:E7) then hit enter. You can also highlight/select the cells you want to include.*

OR
  - c. *Select a cell that already contains a Standard Deviation calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells you want the Standard Deviation of.*

## Green Group Instructions, pg. 4

### PRESENTATION PREP: Graphing

1. Each student will plot the averages on a graph (pollutant vs. location)
2. In your spreadsheet, highlight the averages for each location. If you are plotting multiple week averages, hold down the “Control” button and click on the squares you want to graph.
3. Click on the bar graph icon OR go to the “Insert” menu and select “Chart.”
4. Select “Column” for chart type then select “Next.”
5. Leave the data range alone and select “Series In: Rows.”
6. Now click on the “Series” tab (top of gray box).
7. Click in the box “Category (X) axis labels” and then highlight your locations. (You should see the X axis labels change from 1, 2, 3... to Alvernon & 22<sup>nd</sup>, Cherry & Glenn, or whatever your locations are.)
8. Select “Next.”
9. Enter a “Chart Title” such as “Average Weekly Carbon Monoxide By Location: Dates” (or whatever your pollutant is for whatever time period.
10. Enter a “Category (X) Axis” such as “Location.”
11. Enter a “Value (Y) Axis” such as “AQI” then select “Next.”
12. Select “Place Chart: As New Sheet” and enter a label such as “CO Graph.”
13. Select “Finish.” Be sure to save your work!
14. Now we are going to add error bars.
15. Double click on one of the bars. You should see squares show up in the middle of all of the bars.
16. A window titled “Format Data Series” should come up.
17. Click on the tab titled “Y Error Bars.”
18. Select “Display Both.”

## Green Group Instructions, pg. 5

19. Under “Error Amount” select “Custom” and click in the “+” field.
20. Now go back to the spread sheet by clicking on the lower left tab.
21. Highlight the cells standard deviation cells that correspond with the averages you plotted.
22. Go back to the chart. Under “Error Amount” select “Custom” and click in the “-” field.
23. Again, go back to the spread sheet and highlight the same standard deviation cells. You should see the error bars on the columns.

### PRESENTATION PREP: Mapping

DO THIS AFTER AT LEAST 1 MONTH’S DATA HAS BEEN COLLECTED.

As a group, plot the average AQI on a map of Tucson using the AQI color code. (AQI color code is found at the bottom of a data page on the website)

1. Draw 3 maps of Tucson on a large sheet of butcher paper (~ 4’ x 4’) and label “Ozone Map”, “Carbon Monoxide Map”, and “Particulate Map”. Decide ahead of time what your map scale will be (e.g. how many inches = how many miles or kilometers). Be sure to include major intersections and landmarks.
2. Mark the locations of the monitoring stations on your maps.
3. On a scratch sheet of paper decide what your boundary distances will be from each station on the map. These boundaries will be your “best guess” regions where the air quality is similar to that registered at the nearest monitoring station.
4. Using the AQI colors, decide on a color scale to indicate pollutant concentrations.

**For example:** The AQI may be “good” and the region would be colored green, but you may want to have light green to represent an average concentration range of 0 to 25, and dark green to represent and AQI range of 25 to 50. You can create a scale for all of the AQI colors (green, yellow, orange, red, purple).

## Green Group Instructions, pg. 6

5. On the map, color in the average pollutant concentrations according to the AQI color scale you created.

### PRESENTATION PREP: Find Trends

1. As a group, analyze trends in air quality based on location in the city.

Consider the following (Use your graphs and maps to help you):

- Are there certain locations in the city that have higher ozone, carbon monoxide,  $PM_{10}$ , or  $PM_{2.5}$ ?
- Do you have any ideas why there may be differences?
- Are these trends consistent over the month, 2 months, 5 months?
- Develop one or more hypothesis to describe the trends. Be careful not to draw conclusions or overstate your data.

### PRESENTATION

Present your data, graphs, hypothesis, and/or conclusions to your class.

## Group Details

### Red Group: Time

<b>Group Summary:</b>	<b>Roles:</b>	<b>Assignment Summary:</b>
<p>This group will compare the pollution levels for ozone (O<sub>3</sub>), carbon monoxide (CO), and particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>) by time of day.</p>	<p>Assign roles. Each person tracks one pollutant.</p> <ol style="list-style-type: none"><li>1. Ozone Tracker</li><li>2. Carbon Monoxide Tracker</li><li>3. PM<sub>10</sub> Tracker</li><li>4. PM<sub>2.5</sub> Tracker</li></ol> <p>If there are more than 4 students, split each day into 2 sections (e.g. 0:00 – 12:00 &amp; 13:00 – 23:00.)</p>	<p>Each student will enter the data for his/her pollutant into a spreadsheet.</p>

### Detailed Instructions:

#### COLLECT DATA: Set-up (1<sup>st</sup> time)

1. Decide on each of your roles (see above).
2. Decide on the location your group will monitor. *Note: PM<sub>10</sub> and PM<sub>2.5</sub> are limited to Green Valley, OR Rose Elementary & Geronimo together)*
3. Go to the activity website (<http://swehsc.pharmacy.arizona.edu/coep/airexercise>) and download the Excel Spreadsheet for the “Red Group: Time.”
4. Save the spread sheet onto your disk or computer.

## Red Group Instructions, pg. 2

### COLLECT DATA: Everytime

1. Open your saved Excel spreadsheet.
2. Go to the bottom of the spreadsheet and select your pollutant (carbon monoxide, ozone, or particulates). This will open the correct sheet.
3. Go to the activity web site and click on “your data” in the “Red Group: Time.”
4. Enter the date you need into the  From:  and  To:  boxes.
5. Make sure the time boxes (hh:mm) read  00:00  and  23:59 . (*Note: If you are looking at today's data, the second box will automatically read the current time. To get a full day of data you need to enter yesterday's date – or Friday's date if it is currently Monday).*)
6. Select the location you are monitoring, scroll down, and then click on “**show report**”.

(Particulate matter is monitored at the following sites: Green Valley PM<sub>10</sub> and PM<sub>2.5</sub>, Geronimo PM<sub>10</sub>, Rose Elementary PM<sub>2.5</sub>.)

7. Write down the data for your pollutant.
8. Enter the date and location you have chosen into the “Red Group: Time” spreadsheet.
9. Enter the data for your pollutant into the spreadsheet.
10. Repeat until all the data is entered.
11. Be sure to save your worksheet!

## Red Group Instructions, pg. 3

### PRESENTATION PREP: Find Averages

1. Find the average and standard deviation for each time at the end of each week or month.
2. You will notice there are some squares with the words “#DIV/0!”. These squares already have the formula to find the average of your data. (Note: The average changes as you enter the data.)
3. You will need to enter the formula for the average for the remaining squares. There are several ways to do this – try one of each of the ways.
  - a. *Go to INSERT **F** FUNCTION **F** select AVERAGE **F** enter the first and last cell numbers you want to average separated by a colon. In the next empty average box that would be (B12:F12).*

OR
  - b. *Type =average(B12:F12) then hit enter. You can also highlight/select the cells you want to include.*

OR
  - c. *Select a cell that already contains an average calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells you want the average of.*
4. You will need to find the Standard Deviation (which tells you how variable your data is or how much of a change there is at the same time on different weekdays). There are several ways to do this – try one of each of the ways.
  - a. *go to INSERT **F** FUNCTION **F** select STDEV **F** enter the first and last cell numbers you want to average separated by a colon. In the next empty Standard Deviation box that would be (B12:F12).*

OR
  - b. *Type =stdev(B12:F12) then hit enter. You can also highlight/select the cells you want to include.*

OR
  - c. *Select a cell that already contains a Standard Deviation calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells for which you want the Standard Deviation.*

## Red Group Instructions, pg. 4

### PRESENTATION PREP: Graphing

1. Each student will plot the averages on a graph (pollutant level vs. time).
2. In your spreadsheet, highlight the numbers under “Average” from Midnight (00:00) down to 23:00 hours.
3. Click on the bar graph icon OR go to the “Insert” menu and select “Chart.”
4. Select “Column” for chart type then select “Next.”
5. Leave the data range alone and select “Series In: Columns” then select “Next.”
6. Now click on the “Series” tab (top of gray box).
7. Click in the box “Category (X) axis labels” and then highlight “Midnight, 1:00, 2:00...down to 23:00.” (You should see the X axis labels change to Midnight, 1:00, etc. instead of 1, 2, 3...)
8. Select “Next.”
9. Enter a “Chart Title” such as “Daily Carbon Monoxide Levels: Dates” (or whatever your pollutant is for whatever time period).
10. Enter a “Category (X) Axis” such as “Hours.”
11. Enter a “Value (Y) Axis” such as “PPM” (or whatever units your pollutant is measured in) then select “Next.”
12. Select “Place Chart: As New Sheet” and enter a label such as “CO Graph.”
13. Select “Finish.” Be sure to save your work!

### PRESENTATION PREP: Find Trends

1. As a group, analyze trends in air quality based on time. Consider the following (use your graphs to help you):
  - Are there certain times of day with more ozone, carbon monoxide,  $PM_{10}$ , or  $PM_{2.5}$  ?
  - Do you have any ideas why certain pollutants may be higher at certain times of day?
  - Are these trends consistent over the month, 2 months, 5 months?
  - Develop one or more hypothesis to describe the trends. Be careful not to draw conclusions or overstate your data.

### PRESENTATION

Present your data, graphs, hypothesis, and/or conclusions to your class.

## Group Details

# Blue Group: Weather

<b>Group Summary:</b>	<b>Roles:</b>	<b>Assignment Summary:</b>
<p>This group will track the wind speed and direction, humidity, rainfall, and temperature in the city via the Internet.</p>	<p>Assign roles. Each person tracks one weather feature or pollutant.</p> <ol style="list-style-type: none"><li>1. Wind Tracker</li><li>2. Ozone Tracker</li><li>3. Humidity Tracker</li><li>4. Particulate Tracker (PM<sub>10</sub> &amp; PM<sub>2.5</sub>)</li><li>5. Rain Tracker</li><li>6. Carbon Monoxide Tracker</li><li>7. Temperature Tracker</li></ol>	<p>Each student will enter the data into a spreadsheet for his/her pollutant or weather feature.</p>

### COLLECT DATA: Set-up (1<sup>st</sup> time)

1. Decide on each of your roles (see above).
2. Decide on the location your group will monitor – 22<sup>nd</sup> & Craycroft or Rose Elementary. (*Note: PM tracker will use Geronimo for PM<sub>10</sub> & Rose Elementary for PM<sub>2.5</sub>*)
3. Go to the activity website (<http://swehsc.pharmacy.arizona.edu/coep/airexercise>) and download the Excel Spreadsheet for the “Blue Group: Weather.”
4. Save the spread sheet onto your disk or computer.

## Blue Group Instructions, pg. 2

### COLLECT DATA: Everytime

1. Open your previously saved Excel spread sheet for “Blue Group: Weather”
2. Go to the activity website (<http://swehsc.pharmacy.arizona.edu/coep/airexercise>) and click on the “Your Data” in the “Blue Group: Weather” column to obtain current weather data.
3. Select either the 22<sup>nd</sup> & Craycroft location or Rose Elementary Location.
4. Enter the date you need into the  From:  and  To:  boxes.
5. Make sure the time boxes (hh:mm) read  00:00  and  23:59 . (*Note: If you are looking at today’s data, the second box will automatically read the current time. To get a full day of data you need to enter yesterday’s date – or Friday’s date if it is currently Monday*).
6. Click on “Show Report.”

The abbreviations for the weather data are:

- OTP – outside temperature in degrees farenheight
- VWD – variable wind direction in degrees
- VWS – variable wind speed in miles per hour
- RH – relative humidity in percent

7. Enter the date into the “Blue Group: Weather” spreadsheet.
8. Enter the data for your pollutant or weather feature into your spreadsheet.
9. Be sure to save your worksheet.

## Blue Group Instructions, pg. 3

### PRESENTATION PREP: Graphing 1<sup>st</sup> Presentation

Plot the data on a graph (weather vs. time or pollutant level vs. time).

1. Go to your spreadsheet and hold down the control button on the keyboard. With your mouse highlight the data for 8:00 and 17:00 for each day. (Continue to hold down control button.)
2. Click on the bar graph icon OR go to the “Insert” menu and select “Chart.”
3. Select “Column” for chart type then select “Next.”
4. Leave the data range alone and select “Series In: Columns.”
5. Select “Next.”
6. Enter a “Chart Title” such as “Wind Speed: Location” (or whatever your pollutant).
7. Enter a “Category (X) Axis” such as “Time.”
8. Enter a “Value (Y) Axis” such as “MPH” (or whatever units go with what you track) then select “Next.”
9. Select “Place Chart: As New Sheet” and enter a label such as “Wind Graph 1.”
10. Select “Finish.”
11. Now refine your graph: (See Example)
  - A. Delete the series box (right side of graph).
  - B. Change the background color:
    - Double click in the open part of the graph.
    - In the “Area” section click on the white square.
  - C. Create Text Boxes for each day:
    - Type the date in the black space at the top of the Excel window (following the = ).
    - Hit enter.
    - Drag the text box to the appropriate location on the graph.

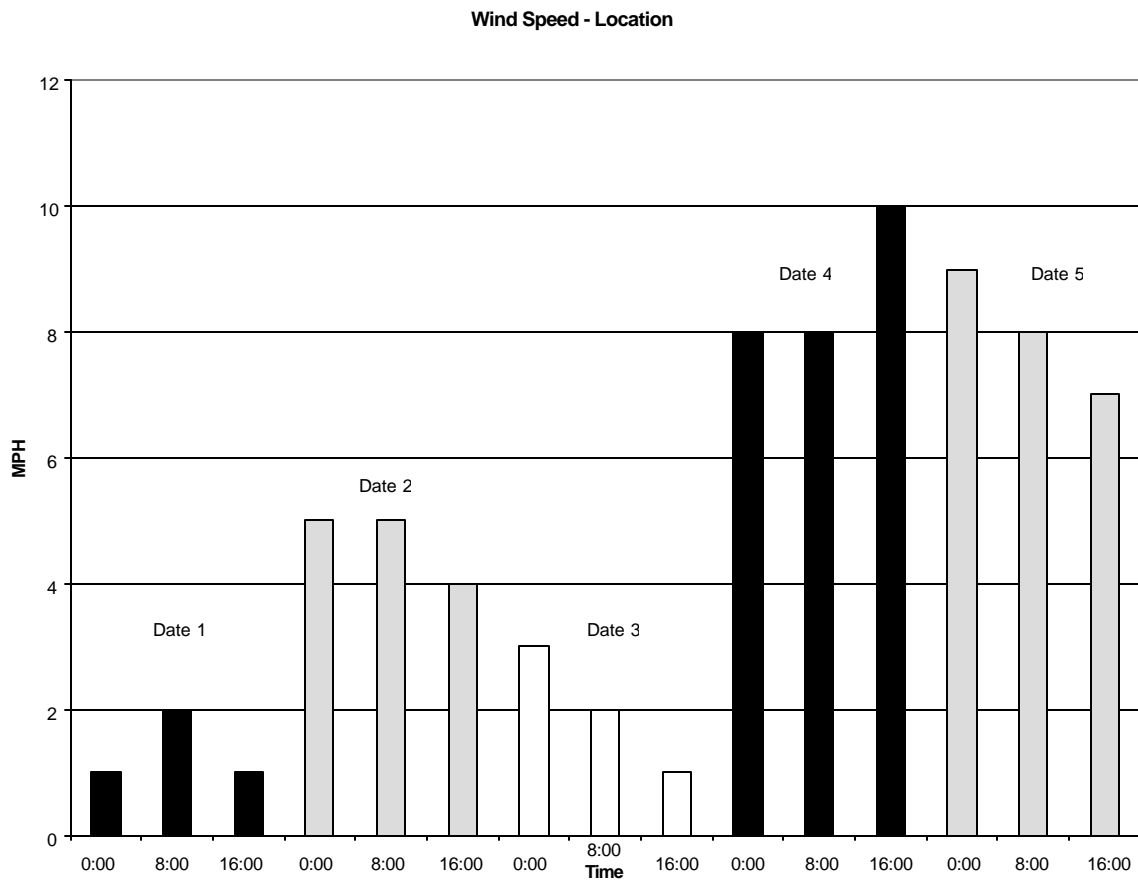
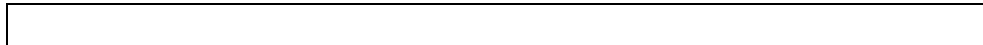
## Blue Group Instructions, Pg. 4

### C. Change the X-Axis labels:

- Double click at the bottom of the graph and select the tab labeled “Patterns” then under “Tick Mark Labels” select “None.”
- Create your own tick mark labels (0:00, 8:00, 16:00) for the x-axis by creating text boxes and dragging the boxes down to the appropriate location at the bottom of the graph. Repeat for each day.

### D. Color code the days:

- Double click on the inside of a single bar (only that bar should highlight – not with squares in all the bars).
- The “Format Plot Area” window should come up.
- Select “Fill Effects.” Use the same color code for each day – SEE BELOW (for each 0:00, 8:00, 16:00 period).



## Blue Group Instructions, Pg. 4

### PRESENTATION PREP: Find Averages

DO THIS AFTER EACH FULL MONTH OF DATA IS ENTERED (20 DAYS).

1. Find the average and standard deviation for each time at the end of each month.
2. You will notice there are some squares with the words “#DIV/0!”. These squares already have the formula to find the average of your data. (Note: The average changes as you enter the data.)
3. You will need to enter the formula for the average for the remaining squares.
4. Select a cell that already contains an average calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells for which you want to take the average (Note: 16:00 will be one cell number higher than 8:00 a.m. – e.g. B104 instead of B103).
5. You will need to find the Standard Deviation (which tells you how variable your data is or how much of a change in the weather there is on different days at the same time). Do this by copying and pasting the formula from one Standard Deviation cell into the cell you want.

### PRESENTATION PREP: Graphing #2

DO THIS AFTER EACH FULL MONTH OF DATA IS ENTERED (20 DAYS).

1. Graph the month’s averages for your pollutant using a bar graph.

CHALLENGE: Try to make a scatter plot combining 2 of your variables (e.g. temperature & ozone).

### PRESENTATION PREP: Find Trends

1. As a group, analyze trends in air quality based on different weather events.

Consider the following (use your graphs to help you):

- Does ozone, carbon monoxide,  $PM_{10}$ , or  $PM_{2.5}$  increase, decrease, or not change as a function of temperature, wind, humidity, or other weather feature?
- Are these trends consistent over the month, 2 months, 5 months?
- Develop one or more hypothesis to describe the trends. Be careful not to draw conclusions or overstate your data.

### PRESENTATION

Present your data, graphs, hypothesis, and/or conclusions to your class.

## Group Details

# Yellow Group: Health

<b>Group Summary:</b>	<b>Roles:</b>	<b>Assignment Summary:</b>
<p>This group will monitor the frequency of asthma attacks at several schools within the school district. They will compare asthma attack trends with Air Quality ratings at the nearest tracking locations.</p>	<p>Assign roles.</p> <ol style="list-style-type: none"><li>1. Health Tracker (number depends on how many schools participate)</li><li>2. Ozone Tracker</li><li>3. Carbon Monoxide Tracker</li><li>4. Particulate Tracker (PM<sub>10</sub> &amp; PM<sub>2.5</sub>)</li></ol>	<p>Each student will enter asthma or pollution data into a spreadsheet.</p>

### COLLECT DATA: Set-up (1<sup>st</sup> time)

1. Decide on each of your roles (see above).
2. Decide on the location you are going to monitor (try to pick one close to your school)

*Note: The Particulate tracker will need to monitor at Rose Elementary & Geronimo (to get both PM types), or Green Valley.*

3. Go to the activity website (<http://swehsc.pharmacy.arizona.edu/coep/airexercise>) and download the Excel Spreadsheet for the “Yellow Group: Health.”
4. Save the spreadsheet onto your disk or computer.

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5. Go back to the website and look at “The Nurse Form.”
6. Compose a letter or phone call dialogue to contact nurses to invite their participation in your research. Be sure to mention that they can use the website form to enter their data, or you can make other arrangements to get the data from the nurses.

### COLLECT DATA: Everytime

Open the Excel spread sheet for “Yellow Group: Health”

1. Go to the activity web site, click “Pollution Tracker Data” to obtain air quality/pollution data.
2. Choose the date you need.
3. Click on “**view**” **PSI Report text/html**. You see the locations listed.
4. Enter the date you have chosen into the “Yellow Group: Health” spreadsheet.
5. Enter the data for your pollutant into the spreadsheet.

**Health Trackers:** When you receive the data from the nurses, enter it into the spreadsheet for the correct date and location.

6. Repeat until all of the data is entered.

Be sure to save your worksheet!

### PRESENTATION PREP: Research

1. Do some research to add to your background knowledge. (Do this during the first two weeks while you wait for the nurses to respond).
2. Each group member should try to select a different activity. The information you gather will be shared as your 1<sup>st</sup> report.
  - a. Conduct research about asthma.

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- b. Research the number of people admitted to local emergency rooms for asthma attacks.
- c. Research the number of people with asthma nationally and locally.
- d. Interview someone with asthma.
- e. Pick a topic related to health and air pollution.

### PRESENTATION PREP: Daily Data Graphs

1. Plot the data on a graph (pollutant level vs. time or asthma attacks vs. time).
2. Go to your spreadsheet and highlight the data for the first 2 weeks (or whatever time period you are reporting).  
  
*Note: Health trackers will highlight the "Total" column.*
3. Click on the bar graph icon OR go to the "Insert" menu and select "Chart."
4. Select "Column" for chart type then select "Next."
5. Leave the data range alone and select "Series In: Columns."
6. Now click on the "Series" tab (top of gray box) "Category (x) axis labels", go back to your spreadsheet, and highlight the corresponding dates. (This will change the X-axis labels to the dates you want.)
7. Select "Next."
8. Enter a "Chart Title" such as "Asthma Incidence: Location" (or whatever your pollutant).
9. Enter a "Category (X) Axis" such as "Dates."
10. Enter a "Value (Y) Axis" such as "Asthma Incidents" (or whatever units go with what you track) then select "Next."
11. Select "Place Chart: As New Sheet" and enter a label such as "Asthma Graph 1."
12. Select "Finish."

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### PRESENTATION PREP: Find Averages (monthly)

DO THIS AFTER EACH FULL MONTH OF DATA IS ENTERED (20 DAYS).

1. Find the average and standard deviation for each time at the end of each reporting period.
2. **HEALTH TRACKERS:** Because you need to combine your asthma data before you can average it, calculate the total number of asthma incidents. Days 1 & 2 are calculated for you. To get the total highlight the row you want to add including the square for the answer (e.g. C7, D7, E7, F7) and then type **=sum(C7:E7)** in the square F7.
3. **POLLUTION & HEALTH TRACKERS:** You will notice there are some squares with the words “#DIV/0!”. These squares already have the formula to find the average of your data. (Notice that the average changes as you enter the data.)
4. You will need to enter the formula for the average for the remaining squares. There are several ways to do this – try one of each of the ways.
  - a. Go to **INSERT** **F**FUNCTION **F**select **AVERAGE** **F**enter the first and last cell numbers you want to average separated by a colon. In the next blank average box that would be (H5:H24).
  - OR
  - b. Type **=average(H5:H24)** then hit enter. You can also highlight/select the cells you want to include.
  - OR
  - c. Select a cell that already contains an average calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells you want the average of.
5. You will need to find the Standard Deviation (which tells you how variable your data is). There are several ways to do this – try one of each of the ways.
  - a. go to **INSERT** **F**FUNCTION **F**select **STDEV** **F**enter the first and last cell numbers you want to average separated by a colon. In the third Standard Deviation box that would be (H5:H24)..
  - OR
  - b. Type **=stdev(H5:H24)** then hit enter. You can also highlight/select the cells you want to include.
  - OR
  - c. Select a cell that already contains a Standard Deviation calculation. Copy the cell and paste the formula into the cell you want. Be sure to double check that the formula includes the correct cells you want the Standard Deviation of.

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### PRESENTATION PREP: Monthly Data Graphs

1. Graph the average monthly data only after at least 2 months' worth of data has been collected. Otherwise, create a graph that contains all of the days (see above "Daily Data" graphing instructions).
2. Go to your spreadsheet, hold down the "Control" button and highlight the average for each month (you do not need to highlight the daily data).
3. Click on the bar graph icon OR go to the "Insert" menu and select "Chart."
4. Select "Column" for chart type then select "Next."
5. Leave the data range alone and select "Series In: Columns" then select "Next."
6. Now click on the "Series" tab (top of gray box).
7. Click in the box "Category (X) axis labels" and then type in the date range for each month separated by commas (January 1-31, February 1-28).
8. Select "Next."
9. Enter a "Chart Title" such as "Monthly Asthma Attacks: Location" (or whatever your pollutant is for whatever location).
10. Enter a "Category (X) Axis" such as "Dates."
11. Enter a "Value (Y) Axis" such as "Number of Asthma Attacks" then select "Next."
12. Select "Place Chart: As New Sheet" and enter a label such as "Monthly Asthma Graph."
13. Select "Finish."

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### PRESENTATION PREP: Find Trends

1. As a group, analyze trends in asthma incidents and individual air pollutants (ozone, carbon monoxide, PM<sub>10</sub>, and PM<sub>2.5</sub>.)

Consider the following:

- Are there increases in asthma attacks with increases in any of the pollutants you are monitoring (ozone, carbon monoxide, PM<sub>10</sub>, and PM<sub>2.5</sub>.)?
- Are there other factors to consider with each asthma attack (e.g. was it induced by exercise)?
- Are these trends consistent over the month, 2 months, 5 months?
- Develop one or more hypothesis to describe the trends. Be careful not to draw conclusions or overstate your data.

### PRESENTATION

Present your data, graphs, hypothesis, and/or conclusions to your class.

## Group Details

### Brown Group: Visibility

<b>Group Summary:</b>	<b>Roles:</b>	<b>Assignment Summary:</b>
This group will monitor the visibility by monitoring the webcam. They will compare the visibility and pollution color with respect to concentration and type of pollutant.	Assign roles. <ol style="list-style-type: none"><li>1. Webcam tracker</li><li>2. Weather tracker</li></ol> Pollution Trackers: <ol style="list-style-type: none"><li>3. Ozone tracker</li><li>4. Carbon Monoxide (CO) tracker</li><li>5. Particulate tracker (PM<sub>10</sub> &amp; PM<sub>2.5</sub>)</li></ol>	Each student will enter the data into the spreadsheet for whatever s/he is tracking.

#### COLLECT DATA: Set-up (1<sup>st</sup> time)

1. Decide on each of your roles (see above).
2. If you are a “Weather Tracker” or “Pollution Tracker,” go to the activity website (<http://swehsc.pharmacy.arizona.edu/coep/airexercise>) and click on “Get Your Spreadsheet.”
3. Save the spreadsheet onto your disk or computer.
4. Your monitoring location will be Rose Elementary. *Note: The PM tracker has to obtain data from Rose Elementary & Geronimo (together).*
5. As a group, decide what time of day you will monitor (e.g. 8 a.m.). It is recommended that you monitor sometime between 7-10 a.m. and/or 4-6 p.m.

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### COLLECT DATA: Everytime

Webcam Tracker	Weather Trackers	Pollution Trackers
<ol style="list-style-type: none"> <li>1. Go to the activity website and click on the “Visibility Page”</li> <li>2. View and save image to your disk.               <ol style="list-style-type: none"> <li>a. If a dialogue box appears with a warning, CLICK “CONTINUE.” This may happen 2 or more times.</li> <li>b. Look at the photos. Go to the <b>digital panorama</b>. CLICK on the image to bring up the full sized image.</li> <li>c. To save this image:                   <ul style="list-style-type: none"> <li>- RIGHT CLICK on the image. In the box that pops up CLICK “save image/picture as.” A box will appear.</li> <li>- Pick your FOLDER: In the box you can navigate to the folder where you are storing your images.</li> <li>- NAME your file. Use a standard format for each file. For example, a file saved on December 3, 2002 at 8am might be “02.12.03.8am.” This format also makes it easy to sort through large number of images from many years.</li> <li>- CLICK “SAVE.”</li> </ul> </li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Open the Excel spread sheet for “Brown Group: Visibility.”</li> <li>2. Go to the activity web site <a href="http://swehsc.pharmacy.arizona.edu/coep/airexercise">http://swehsc.pharmacy.arizona.edu/coep/airexercise</a>, click “Get Your Data” in the “Brown Group: Visibility” column to obtain current weather data.</li> <li>3. Enter the date you need into the <input type="text"/> From: <input type="text"/> and <input type="text"/> To: <input type="text"/> boxes.</li> <li>4. Enter the time you are monitoring into the boxes e.g <input type="text"/> 8:00 <input type="text"/> and <input type="text"/> 9:00 <input type="text"/>. <i>(Note: If you are looking at the afternoon data remember to use military time – 13:00 for 1:00 p.m.).</i></li> <li>5. Select “Rose Elementary”, scroll down, and then click on “<b>show report</b>”.</li> <li>6. The abbreviations for the data you will collect are:               <ul style="list-style-type: none"> <li>- RH – relative humidity in percent</li> </ul> </li> <li>7. Enter the date into the “Brown Group: Visibility” spreadsheet.</li> <li>8. Enter the data into the spreadsheet (you will do this daily).               <ul style="list-style-type: none"> <li>- Be sure to save your worksheet.</li> </ul> </li> </ol>	<ol style="list-style-type: none"> <li>1. Open your saved Excel spreadsheet.</li> <li>2. Go to the activity web site and click on “your data” in the “Brown Group: Visibility.”</li> <li>3. Enter the date you need into the <input type="text"/> From: <input type="text"/> and <input type="text"/> To: <input type="text"/> boxes.</li> <li>4. Enter the time you are monitoring into the boxes e.g <input type="text"/> 8:00 <input type="text"/> and <input type="text"/> 9:00 <input type="text"/>. <i>(Note: If you are looking at the afternoon data remember to use military time – 13:00 for 1:00 p.m.).</i></li> <li>5. Select “Rose Elementary”, scroll down, and then click on “<b>show report</b>”.</li> <li>6. Enter the date &amp; data for your pollutant into the spreadsheet.</li> <li>7. Repeat until all the data is entered.</li> <li>8. Be sure to save your worksheet!</li> </ol>

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### PRESENTATION PREP: Graphing & Photo Comparison

1. Your group needs to create graphs of your data and identify trends in the webcam photos

#### CREATE GRAPHS FOR POLLUTION & WEATHER DATA

2. In your spreadsheet, highlight the data for pollutant and the days you are investigating.
3. Click on the bar graph icon OR go to the “Insert” menu and select “Chart.”
4. Select “Column” for chart type then select “Next.”
5. Leave the data range alone and select “Series In: Columns.”
6. Now click on the “Series” tab (top of gray box).
7. Click in the box “Category (X) axis labels” and then go back to your spreadsheet and highlight the dates for your data. (This will change the x-axis labels to your dates).
8. Select “Next.”
9. Enter a “Chart Title” such as “Daily Carbon Monoxide Levels: Location” (or whatever your pollutant is).
10. Enter a “Category (X) Axis” such as “Date.”
11. Enter a “Value (Y) Axis” such as “PPM” (or whatever unit your pollutant or weather feature is measured in) then select “Next.”
12. Select “Place Chart: As New Sheet” and enter a label such as “CO Graph.”
13. Select “Finish.”

#### PHOTO COMPARISON

1. Place the photos in a format where you can look at the photos and the graphs at the same time.

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SUGGESTIONS: You may need to have:

- a) A photo of each day that corresponds with the high & low for a specific pollutant or weather event; OR
- b) A week's worth of photos per page with one graph; OR
- c) A week's worth of photos per page with several graphs, or, (or some other configuration).

This is up to you – just make sure your audience can see your data and understand it!

### PRESENTATION PREP: Find Trends

9. As a group, analyze trends in visibility and individual air pollutants (ozone, carbon monoxide,  $PM_{10}$ , and  $PM_{2.5}$ ) and weather.

Consider the following:

- How does weather affect visibility?
- Are there color's associated with different pollutants (e.g. brown, gray, white)?
- Does the pollution or weather affect only one section or level on the horizon? (Use a landmark)
- Are these trends consistent over the month, 2 months, 5 months?
- Develop one or more hypotheses to describe the trends. Be careful not to overstate your data.

### PRESENTATION

Present your data, graphs, hypothesis, and/or conclusions to your class.