

# Recommendation for a Phoenix Area Visibility Index

by the

Visibility Index Oversight Committee

March 5, 2003

**Final Report**

## Introduction

Executive Order 2000-3 directed the Governor's Brown Cloud Summit "to establish options for a visibility standard or other method to track progress in improving visibility in the Phoenix area." A subcommittee was established to develop options to fulfill this directive. The Summit, as reflected in its Report of January 16, 2001, concluded that the daily visibility index for the metropolitan area should have its characteristics defined through a public survey process. This process called for a representative cross-section of residents of Area A (Metropolitan Phoenix Area) to determine what visual air qualities are desirable, what visual range is acceptable, and how often the combination of acceptable visual range and air quality is preferred.

With House Bill 2538 (45<sup>th</sup> Legislature, first regular session, 2001) the Arizona Legislature moved forward the Summit's recommendation to establish a visibility index by requiring the ADEQ director to establish, on or before December 31, 2003, a daily visibility index to evaluate and report current visibility conditions and progress towards visibility improvements goals in Area A. The legislation specified that the index shall be used for the purpose of visibility improvement goals under the sole jurisdiction of ADEQ and shall not constitute a standard or be used to establish emission limitations in air pollution permits issued by the state or a county.

The Visibility Index Oversight Committee was established to assist ADEQ in developing the index. In early 2002, ADEQ awarded a contract to BBC Research and Consulting to develop and conduct a public survey. The Committee was asked to provide advice to ADEQ in the following ways:

- ▶ Review the consultant's proposal for conducting the visibility survey;
- ▶ Meet with the selected contractor after the actual survey is complete to discuss likely success and whether additional surveying may be required;
- ▶ Review the draft analysis report from the contractor, release it for public comment, and hopefully provide consensus support for the final version;
- ▶ Provide the visibility index to the Cap and Trade Oversight Committee for their consideration as one method to track progress in improving visibility;
- ▶ Present the index to the public jointly with ADEQ at a media event.

Visibility Index Oversight Committee Members:

Leandra Lewis, Exec. Director Arizona Clean and Beautiful (Chairwoman)  
Richard A. Bark, Gallagher & Kennedy  
Dave Berry, Swift Transportation  
Molly Greene, SRP

Yvonne Hunter, APS  
Gaye Knight, City of Phoenix  
Jay Kaprosy, Director, Government Relations, Greater Phoenix Chamber of Commerce  
Diane McCarthy, President, WestMarc  
Tom Moore, Technical Project Coordinator, Western Regional Air Partnership  
Karen Rasmussen, Arizona Motor Transport Association  
Nancy Wrona, Director Air Quality Division, AZ Department of Environmental Quality

## **Decision Process**

The first meeting of the Committee was held on May 3, 2002. At this meeting BBC Research and Consulting presented the Committee with a draft survey approach. The draft approach was discussed and revised to reflect member comments. On June 20, 2002, BBC returned to present the Committee with the final survey instrument and conducted a “Beta Test,” where each member was able to participate in a trial presentation of the survey planned for the field study. Members provided ADEQ and BBC feedback on the survey process which resulted in minor revisions to the survey instrument. The Committee concluded that the survey methodology was acceptable and directed ADEQ and BBC to proceed with the field work

Having an approved survey instrument, BBC began the field survey in July of 2002. The BBC study team administered 27 sessions in controlled environments (similar room configuration, lighting, observer distance from screen, etc.). The sessions included a total of 385 participants at six locations in the Phoenix Metropolitan Area. Participants were recruited to be demographically representative of four regions of Area A, and three sessions were conducted in Spanish. Participants attended group sessions (of no more than 20 participants), viewed 21 different images that showed varying visibility levels, and completed a written questionnaire commenting on the slides. There were three primary parts to the survey instrument:

1. The first was designed to capture individuals’ ratings of the level of visual air quality in each slide on a 7-point scale of very poor to excellent;
2. The second asked respondents to indicate if the visible air quality in each slide was acceptable or unacceptable; and
3. The third asked respondents to indicate the number of days in which a given level of visible air quality would be acceptable.
- 4.

Upon conclusion of the survey sessions, BBC began the process of data entry and statistical analysis. A draft survey report was completed and presented to the Committee on two separate occasions during October 2002. The report included extensive statistical analysis and implications of survey findings. The Committee provided ADEQ and BBC a variety of initial comments on the draft report and suggested a peer review to further support its validity. ADEQ arranged for a peer review of the draft report by Mike O’Neil, O’Neil and Associates, who provided comments to the Committee.

On December 9, 2002, ADEQ presented the Committee with visibility trends in the Phoenix area as background to forming the index. During this time, ADEQ contracted with Air Pollution Evaluations and Solutions to evaluate the results of the survey and propose to the Committee options for the visibility index. At the January 15, 2003, meeting, the contractor presented two options to the Committee:

1. A bright-line standard approach, similar in form to a National Ambient Air Quality Standards, and
2. An index category approach (i.e., excellent to very poor), similar in form to EPA's Air Quality Index used by state and local agencies to report air pollution status to the public.

Each option was compared to historical visibility data collected in the Phoenix area to illustrate its potential outcome.

The Committee then moved forward to address several components of an index. The components discussed by the members included:

1. Methodology to best represent daylight hours,
2. Rolling averages versus block averages,
3. Approach for the visibility index; index category (i.e. excellent to very poor) or bright line approach,
4. Averaging period (i.e. 2, 3, 6, 12 hour averaging),
5. Category thresholds, and
6. Environmental goal of the index.

During meetings in January and February of 2003, the Committee addressed components described above and formed a consensus on each item. A complete description of each component decision is included in the next section.

## Committee Recommendation

<b>Recommended Visibility Index for Area A</b>	
<b>1. Index Categories</b>	
Category	Deciview Range
Excellent	14 or less
Good	15 to 20
Fair	21 to 24
Poor	25 to 28
Very Poor	29 or greater
<b>2. Averaging</b>	
4-Hour Rolling Average	
<b>3. Statistic for Reporting Period</b>	
Highest Daily Average Deciview Value, as measured during daylight hours (adjusted monthly)	
<b>4. Environmental Goal</b>	
<p>Show continued progress through 2018</p> <p>Move days in the poor/very poor categories up to the fair category</p> <p>Move days in the fair category up to the good/excellent categories</p> <p>Progress assessment to be conducted every 5 years through 2018</p>	

Details of the discussions and conclusions for each component of the visibility index are described below:

1. Methodology to best represent daylight hours

The Committee concluded that using actual daylight hours was preferred over fixed clock hours (e.g., 6:00 a.m. to 6:00 p.m.). Members noted that actual daylight hours would range from 11 to 15 hours per day depending on the season and should be updated on a monthly basis. A fixed clock method would have utilized pre-dawn and post-sunset hours in the winter, and neglected early morning and early evening daylight hours during summer.

2. Use a rolling average or a block average.

The Committee selected rolling averages over block averages concluding that rolling averages would be most feasible given selection of actual daylight hours.

3. Approach for the visibility index; index category (i.e., excellent to very poor) or bright line approach.

The Committee recommended using index categories (e.g., excellent to very poor) rather than a “bright line” approach. The members reasoned that an index category approach using excellent, good, fair, poor, and very poor categories is much easier for the general public to understand. It includes categories which reflect what people actually see, and is a more intuitive method.

4. Determine averaging period (i.e. 2, 3, 6, 12 hour).

The Committee selected 4-hour averaging for the visibility index, concluding that this averaging period best represents the ability to provide timely information to the public and also provide a measurement period that can be most useful in longer term trend analysis. The Committee came to general agreement that ADEQ is to proceed with data analysis and reporting as appropriate and feasible, but that the daily value used for comparison to the long term trend (see #6 environmental goal) should be based upon the worst 4-hour average.

5. Determine category thresholds.

Based upon the technical analysis of the survey results conducted by Air Pollution Evaluations and Solutions, the Committee selected the following category thresholds for the visibility index: 1-14 deciviews - excellent; 15-20 deciviews - good; 21-24 deciviews - fair; 25-28 deciviews - poor; and 29 or more deciviews - very poor.

6. Determine the environmental goal.

The Committee selected the following environmental goal: A goal with the purpose of showing continued progress through 2018 by; 1) improving visibility to move days now in the poor/very poor categories up to the fair category, and 2) moving days classified as fair to the good/excellent categories. A progress assessment will be conducted every 5 years through 2018. The members concluded that this option provides a clear, long term method to track visibility trends in the Phoenix metropolitan area.

Additionally, the Committee reached general agreement that the index should not be used to affect short term actions because other programs, such as the High Pollution Advisory Program, are currently in place.