

## **APPENDICES**

APPENDIX AA: HIA METHODS

APPENDIX A: SUMMARY OF THE NATURAL GAS DRILLING PROCESS

APPENDIX B: NATURAL GAS DEVELOPMENT IN THE PICEANCE BASIN

APPENDIX BB SITE DESCRIPTION OF BATTLEMENT MESA

APPENDIX C: BATTLEMENT MESA BASELINE HEALTH PROFILE

APPENDIX D: HUMAN HEALTH RISK ASSESSMENT

APPENDIX E: COMMENTS ON SEPTEMBER 2010 DRAFT HEALTH IMPACT  
ASSESSMENT

APPENDIX F: RESPONSES TO COMMENTS ON SEPTEMBER 2010 DRAFT  
HEALTH IMPACT ASSESSMENT

## **APPENDEIX AA**

### **1 HIA Methods**

Methods for the HIA were based upon guidelines provided by the Pew Health Impact Project<sup>100</sup>, as well as those found in the Merseyside Guidelines for HIA<sup>101</sup>. There are seven steps for this HIA, including scoping, screening, assessment, recommendations, implementation, reporting, and evaluation.

#### ***1.1 Screening***

This HIA is was performed in response to a citizen petition to the Garfield County BOCC requesting a health an environment study be conducted to evaluate potential health impacts of Antero's natural gas project in Battlement Mesa. Garfield County has several years of experience with natural gas development and production and with community concerns over air and water degradation and the potential health impact. The county has responded by initiating ongoing ambient air monitoring and had previously commissioned the 2008 Community Health Risk Analysis of Oil and Gas Industry Impacts in Garfield County, Colorado (referred to as the Saccomanno Study)<sup>21</sup>. Based upon the results of the air monitoring and the recommendations of the Saccomanno Study, GCPH determined that an HIA could be used to provide decision makers (the BOCC) with valuable information that could allow them to respond to citizen concerns and help them in making informed decisions.

#### ***1.2 Scoping***

The Scope of the HIA was defined in part by the requests outlined in the BCC petition (Attachment 1). We determined that assembly and analysis of baseline health, environmental, and social data were possible within the framework of a HIA. In order to further elucidate specific stakeholder concerns, we conducted a series of stakeholder meetings with citizens, the industry state regulatory agency, the state health department, and Antero representatives (Tables 1 and 2). As a result of this stakeholder process, a Scope of Work was written that was informed by citizen concerns in order to provide a framework for the HIA. This work ultimately led to a focus on eight areas of health concern (stressors) specific to natural gas development and production: air emissions, water and soil contaminants, truck traffic, noise/light/vibration, health infrastructure, accidents and malfunctions, community wellness, and economics/employment.

#### ***1.3 Assessment***

The assessment of the stressors began with a demographic characterization of the population of Battlement Mesa and a baseline health characterization of the community by compiling information from a variety of sources. A Battlement Mesa Baseline Health Profile is included in Appendix C. This information was used to describe the general population, as well as identify potentially high risk sub-populations. A health literature review, previously conducted by members our team, was used to identify potential health risks and vulnerable subpopulations associated with natural gas development and production<sup>102-103</sup>. A human health risk assessment was conducted using longitudinal air and water quality data (Appendix D). All this information was used to develop assessments of air quality, water and soil quality, traffic, noise, community wellness, economics/employment, health infrastructure, and accidents/malfunctions.

Each assessment of the stressors includes a review of its general impact on physical, mental and/or social health as described in relevant medical and social science literature; a compilation and analysis of existing environmental and health data describing current conditions in Battlement Mesa; the means by which Antero's plans for drilling could alter the stressor; and finally a characterization of the stressor's impact on health. Several physical health outcomes linked to potential exposures are considered, including respiratory, cardiovascular, cancer, psychiatric, and injury/motor vehicle-related impacts on vulnerable and general populations in the community. The Battlement Mesa Baseline Health Profile (Appendix C) provides supporting documentation of baseline physical and social health determinants. . In addition, the stressors's impact on community health and individual well-being related to community health is considered. In addition, the Human Health Risk Assessment (Appendix D) provides a comprehensive review of available air quality and water and soil contamination data and a systematic assessment of related health risk.

Of note, as of the date of this report, Antero had not submitted a Special Use Permit to Garfield County nor had they submitted a Comprehensive Drilling Plan to the COGCC. As such, based on consultation with GCPH, this HIA has been conducted based upon information provided by Antero to the public in community meetings and provided to the CSPH, by request, from Antero. If the ultimate Special Use Permit/Comprehensive Drilling Plan presented by Antero differs from the information available to we, then it is possible that there will be other risks/benefits not identified in this report.

## ***1.4 Recommendations***

We have summarized what is known and not known about the impact of the Antero plans on the stressor and have provided over 70 specific recommendations aimed at decreasing negative impacts and improving positive ones. In general, recommendations focus on reducing air emissions, continued monitoring of air and water sheds and strict enforcement of existing regulations; use of best available current technology and rapid adoption of new technologies to decrease emissions; reduction of risk of traffic and industrial accidents, and development of a community advisory board to facilitate communication with the goal of improving community

well-being. . External review was provided by Habitat Health Impact Consulting and Dr. Teresa Coons, co-author of the Saccomanno Study. CDPHE provided review of the sections describing Physical Health Determinants and the second draft of the Human Health Risk Assessment.

### ***1.5 Reporting***

This document represents the second draft of the HIA(February 2011 Draft). This first draft of the HIA (September 2010 Draft) was delivered to the Garfield County BOCC, and presented at a BOCC meeting and a public meeting in September 2011. The GCPH posted this report on their Battlement Mesa HIA website for public review. The 30 day public comment period was extended for an additional 30 days. We met individually with groups that commented on first draft in the month of January 2011 to clarify comments and responses. Stakeholder comments were considered in the preparation of the this second draft of HIA (February 2011 Draft). A second comment period of 28 days is planned. The final HIA report is expected to be delivered on April 30 2011 and there will be a presentation to the BOCC and the community after the report is finalized in May 2011.

### ***1.6 Implementation***

Implementation of any recommendations in this report is the responsibility of the BOCC. We will assist the BOCC with dissemination and education of the community regarding the findings of the report as needed by conducting community meetings.

### ***1.7 Evaluation***

In order to determine the value of this HIA and HIA process to the Garfield County BOCC and stakeholder groups, the CSPH will monitor Antero's project permitting process at both the county and state level. Our evaluation of HIA effectiveness will be, in part, determined by whether potential health impacts and mitigation strategies were considered when the permitting process occurs. In addition, CSPH will seek specific comments from GCPH and Garfield County BOCC on their assessment of the HIA and HIA process. Furthermore, the CSPH will present the HIA and descriptions of the HIA process at several scientific, professional, and community meetings in 2010-2011. Finally, an evaluation report will be delivered to the BOCC by December 31, 2011.