MEMORANDUM

To: COG Climate Change Steering Committee

From: Edward U. Graham, Water Resources Program Director

Date: January 16, 2007

Subject: Climate Change Impacts; Research Priorities for Water & Wastewater Utilities

The Impacts Report – One aspect of the climate change report on behalf of COG's Climate Change Steering Committee addresses the potential impacts on and the implications for communities and local governments in the COG region. While some of the anticipated impacts of climate change, from sea level rise to alteration of ocean currents, are global, this report is principally focused on impacts that are most likely to affect decisions at the local level in the COG region. The report focuses on what rising sea level, changes in precipitation patterns, increases in surface water temperature and changes in terrestrial habitat may mean. It includes potential impacts in the COG region and covers urban, suburban and rural communities. It also addresses the potential impacts on local government service providers, with an emphasis on water, wastewater & stormwater services.

Attachment A is a draft annotated outline of the "Impacts" section of the pending report.

Research Focused on Water Supply and Wastewater Treatment – While preparing for this report, I was invited to attend a two-day workshop on January 8-9, 2008, jointly sponsored by the American Water Works Association Research Foundation (AwwaRF) and the Water Environment Research Foundation (WERF). These two organizations are the research arms of the water and wastewater industry, respectively, and have taken a leadership position in assessing the implications of climate change on water and wastewater utilities. The importance of these organizations to the COG region is attested to by the fact that Charles Murray, General Manager of Fairfax Water serves on the AwwaRF Board of Trustees and Jerry Johnson, DC-WASA General Manager serves on the WERF Board of Directors.

Water and wastewater utilities are among the leaders in recognizing the need to take climate change seriously. With scientists predicting, among other things, prolonged drought conditions and increased variability in precipitation, water and wastewater utilities are feeling increasingly vulnerable.

The basic purpose of the workshop was to develop and prioritize a research agenda for the water and wastewater industry as it relates to climate change. Perhaps 75+ people were assembled from across the US, the UK and Australia, where CC has hit hard. It afforded a unique opportunity to learn from the

experience of others already impacted by climate change. The following are representative of the type and range of issues that were discussed:

- "The Australian experience is that environmental responses to CC are not gradual, but are quite abrupt - they hit hard and in a dramatic manner."
- An emerging theme for water utilities is to plan for "security through diversity." (Water reuse; smarter use; desalinization; groundwater; surface water; water trading; catchment management.)
- Both the water and wastewater utilities feel it's important to take a leadership position (e.g., in reducing their carbon footprint) as they plan for adaptation. (W&WW utilities use prodigious amounts of electricity mostly for treatment and for pumping.)
- While CC modeling has advanced amazingly since the earliest efforts in the '60s, local climate conditions are below the resolution of the existing models. Modeling grids are at about the 100 km level.
- Better urban planning is needed (vulnerability to flooding and the San Diego fires were cited as examples). [This suggests that CC deserves clear recognition in the Greater Washington 2050. Program.]

The workshop identified nearly 100 potential research topics in the following categories: Energy and Environment; Infrastructure; Management and Communications; Water Quality; and Water Resources. Project ideas ranged from “Assessing the Financial Implications of Climate Change on water and Wastewater utilities,” to “Green Certification Program to Water and Wastewater Utilities,” to “Case Studies for Best Practices to Respond to Extreme Climate Change,” to “Analysis of Reservoir Operations under Climate Change.”

The workshop underscored the seriousness with which water and wastewater utilities are addressing climate change and its potential impact. I came away with a heightened appreciation for the importance of water and wastewater involvement in mitigating, planning for and adapting to climate change.

Attachment A

DRAFT OUTLINE

Climate Change in the Mid-Atlantic Region: Causes, Effects, Impacts and Adaptation

Prepared for COG's Climate Change Committee

Outline prepared January 16, 2007

I. Introduction

A. The Objectives of the Impacts Report

The response to the impact of climate change, globally, regionally and locally, is widespread. The actions to address climate change fall into two broad categories: mitigation - those designed to reduce the emission of greenhouse gases (GHGs); and adaptation - those designed to adapt to the impacts. In the COG region, local governments and water and wastewater utilities are taking steps to reduce their carbon footprint and will face choices to directly address the impacts.

This report is designed to provide a better understanding of the potential local impacts of climate change in the Mid-Atlantic region in order to:

- Underscore the rationale for investing in GHG reduction strategies; and
- To assist in developing plans, setting priorities and setting budgets to address the potential impacts.

B. Focus of the Report

While the anticipated impacts of climate change, from sea level rise to alteration of ocean currents, are global, this report is principally focused on impacts in the Mid-Atlantic region of the United States, i.e., those that are most likely to affect decisions at the local level in the COG region. The report focuses on what rising sea level, changes in precipitation patterns, increases in surface water temperature and changes in terrestrial habitat may mean. It includes potential impacts in both the piedmont and the coastal plain and covers urban, suburban and rural communities. It also addresses the potential impacts on local government service providers, with an emphasis on water, wastewater & stormwater services.

C. Approach

The approach of this report is to extract and apply relevant material from published reports, studies and analyses whose results are applicable to the COG region. The material comes from academic sources, professional associations, and governmental agencies. The specific sources used are:

- **Climate Change Research and the Chesapeake Bay** (draft), dated September 6, 2007. A white paper of the Bay Program's Scientific and Technical Advisory Committee. [STAC Report]
- **Chesapeake Futures – Choices for the 21st Century**, dated January 2003. A report by the Bay Program's Scientific and Technical Advisory Committee.
- Chesapeake Quarterly Issue on **Global Warming and the Bay**, dated November 2006, published by Maryland Sea Grant.
- **Implications of Climate Change for Urban Water Utilities,** October 18, 2007, Association of Metropolitan Water Agencies
- **Climate Change: Emerging Issues for Clean Water Agencies**, November 2007, NACWA

- **Climate Change and Water Resources: A primer for Municipal water providers, National Center for Atmospheric Research, 2005**
- **Note: This is a partial list, reflecting material reviewed as of the date of the outline.**

D. Structure of the Report

The report itself begins with a brief discussion of the fundamental driver of climate change and the anticipated global effects. Shifting to the local level, it identifies first approaches to reducing the carbon footprint. It then describes five major "baseline effects," discusses the key impacts and the type of adaptation that may be necessary.

The baseline effects of climate change are: sea level rise; changes in precipitation patterns; water temperature rise; air temperature rise; and changes in terrestrial habitat. In each case, the impacts are discussed in terms of activities typically carried out by local governments. These are: water supply; wastewater treatment; stormwater management; emergency services; land use and site planning; health care delivery; and vector control. As appropriate, the impacts are discussed in terms of their potential to adversely affect public safety; public health; and environmental health.

II. Global Cause and Effects

A. Key Driver: Temperature Change

B. Global Effects

III. Reducing the Carbon Footprint at the Local Level

IV. Baseline Effects, Local Impacts and Adaptation

A. Baseline Effects: Description and Local Impacts on Public Safety, Public Health and Environmental Health

1. Sea Level Rise

2. Precipitation Pattern Changes

3. Water Temperature Rise

4. Air Temperature Rise

5. Terrestrial Habitat Changes

B. Adaptation at the Local Level

1. Water Supply

2. Wastewater Treatment

3. Stormwater Management

4. Emergency Services

5. Land Use and Site Planning

6. Health Care Delivery

7. Vector Control