Addressing Particulate Matter Pollution In the Roanoke Valley:

Summary and Strategies

Prepared by the Roanoke Valley-Alleghany Regional Commission for the Roanoke Valley Area Metropolitan Planning Organization

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Mission of the Particulate Matter Stakeholder Group

Create a voluntary agreement similar to the Ozone Early Action Plan to address regional fine particular matter (PM 2.5) pollution. This agreement would be adopted by the MPO and would contain a limited collection of strategies to be implemented by local governments and other participating agencies, either to take direct action on reducing PM 2.5 or to provide resources and encouragement for citizens to act. Though the adopted strategies may overlap with a number of air quality and other environmental initiatives, accepted strategies should concentrate on actions and educate that directly address fine particulate matter.

The Roanoke Valley Area Metropolitan Planning Organization serves as a forum for regional stakeholders from both the private and public sector to share ideas. MPO staff will research and develop plan to address PM 2.5 based on stakeholder input; this plan will then be submitted to the MPO policy board for adoption. This plan then serves as a guidance document for all regional agencies, public or private. The RVAMPO has no authority for the implementation of specific strategies except when those strategies involve trip reduction or emissions education through the RIDE Solutions program, or additional resources are made available through grants or in-kind support. In particular, the RVAMPO has no authority over the private sector, though can influence behavior through education, encouragement, and support of local government initiatives.

PM 2.5, Ozone, and CO2

Particulate matter pollution, or soot, is formed of very small particles from a variety of sources. Smoke from fires, dust kicked up from construction sites, vehicle emissions, and related sources all produce particulate matter pollution. In many cases these particles do not impose significant health risks, but in the case of very small particles of 2.5 microns or less, also called fine particulate matter or PM 2.5, the particles can become lodged in the lungs, contributing to or causing a variety of health problems. In the Roanoke region, PM 2.5 is our next major air quality challenge.

While already identified as a major cause and irritant of respiratory and cardiovascular problems, particulate pollution has newly been identified as a possible cause of neurological problems resulting in lower IQ scores and learning disabilities in children exposed to high levels. The EPA is even now in the process of reviewing its current PM 2.5 standards and expectations are those standards will be lowered significantly. The Roanoke region, currently only in borderline compliance, will very likely not meet the new standards once imposed. Further, there is some speculation that, unlike ozone, the EPA will not provide the option of a EAC for particulate matter, meaning noncompliance will result in immediately regulatory action. With health concerns growing and regulatory action imminent, it is through these twin lenses that the problem of particle pollution should be analyzed.

PM 2.5 sources do, in some cases, overlap with those of ozone pollution, the region's top priority in air quality, as well as global climate change. For example, vehicle emissions contain particles of soot, CO2, and volatile organic compounds, all of which are byproducts of the internal combustion process and are components in PM 2.5, climate change, and ozone

respectively. In this case, reducing vehicle emissions – through the reduction in vehicle trips, moving to biodiesel, or increasing vehicle efficiency – can be an effective strategy for addressing each of these important issues. However, it should be noted that even when one source affects multiple environmental and air quality challenges, care should be taken to address these sources effectively. In the above scenario, for example, switching to certain kinds of biodiesel may increase the output of VOCs even as it reduces CO2; strategies associated with ozone pollution, such as filling up your gas tank in the cool hours of the evening, are a function of heat being a necessary catalyst for the formation of ozone, and therefore would have no impact on climate change or PM 2.5; and improved scrubbing mechanisms on vehicle tailpipes can significantly reduce soot but will have zero impact on CO2 or ozone.

Therefore, it is important to recognize PM 2.5 as a distinct air quality challenge requiring unique strategies that may nonetheless share efficiencies with existing air quality programs in the region.

State of Particulate Matter (PM 2.5) Pollution in the Roanoke Region

The Virginia Department of Environmental Quality (VDEQ) shows that the primary *local* sources of PM 2.5 within the Roanoke area were wood stoves, fireplaces, unpaved roads (dust), construction (dust), and small boilers, in order of importance. Line haul and yard locomotives were also noted as significant sources, as was Roanoke Cement. However, even high-producing local sources were relatively small in total pollutant output compared to sources outside the region, but immediate in their impact on local air quality.

VDEQ analysis reveals that a major source of PM 2.5 pollution is generated outside the Roanoke area from coal-burning power plants in far southwest Virginia, West Virginia, Tennessee, and beyond. Emissions from mobile sources such as diesel trucks traveling the I-81, 220, and 460 corridors are also a significant contributors as those emissions become trapped in the valley. Such sources are a significant component of local air quality challenges, but much more removed from the direct impact of local action. The dynamic of particulate matter pollution, therefore, can be described as "local source and small contributor" vs. "outside source and large contributor." This dynamic poses an unforeseen challenge to the stakeholder group, particularly as it relates to educating the public, which is addressed later in this report.

Under current requirements, the Roanoke region is in compliance with EPA's annual standards of 15 micrograms per cubic meter (ug/m_3), having exceeded this standard only in 2005 at both the Roanoke and Salem monitors. In 2006, the Salem monitor was discontinued due to interference from local construction and moved to Round Hill Montessori School in Roanoke. Previous to 2006, both the Roanoke and Salem monitors showed a steady increase in PM 2.5 readings; and while there was a drop in 2006 from the 2005 Roanoke monitor readings, the overall trend the last four years has been upward. Indeed, Virginia DEQ predicts a 10% increase in PM 2.5 levels by 2018, even as other air pollutants are expected to decrease from 20% to 40% over 2002 levels. With current PM 2.5 levels hovering just under the 15 ug/m_3 standard, this projected increase will easily pull the region out of compliance. Further, the current standards are under review by the EPA and may drop even lower.

Though there is not yet an indication that the EPA will allow an Early Action Plan for particulate matter as it has with ozone, it is nonetheless prudent to pursue action that begins to address PM 2.5 pollution now to eliminate the forecasted increase and reduce existing levels, not merely to avoid regulatory action on the part of the EPA but to improve the air quality and health of all Roanoke Valley residents.

Climate Change versus Air Quality: The Challenge of Competing Messages

Before addressing specific PM 2.5 strategies, it might be helpful to definite and explore the relationship between the two related but separate challenges: air quality and climate change. Here, we define air quality as the level of various types of pollutants in our atmosphere which have a negative impact on human health but are primarily local in origin and impact. PM 2.5 and ozone both fall into this category. Climate change we will define as instability in the global climate driven primarily by the build-up of carbon dioxide and other green house gases (GHG) in the atmosphere, whose affects are long term and far-reaching, local in origin but global in impact. In other words, air quality is a local challenge that can be addresses through local strategies, while climate change is a generalized challenge that requires global strategies (even if those strategies require cooperation and coordination on the local level).

Clearly, the message that dominates public environmental awareness right now is global climate change, and both the public and private sectors are responding by moving to measure and reduce their carbon footprint. Roanoke City, Roanoke County, and Salem have all undertaken or completed projects to this end, and Vinton has shown interest in doing the same. Recently, a coalition of Roanoke City and twelve major businesses in the Valley announced they would dedicate themselves to measuring and reducing their own footprint. In all of these cases, a significant – if not the primary – strategy is that of reducing energy consumption, both through the application of energy efficient technology as well as behavior change.

It would seem, therefore, that an effective strategy for dealing with PM 2.5 pollution is to concentrate on that larger source generated by coal-fired power plants, and to enfold the strategy into an overall energy-reduction program that, in many cases, is already being undertaken as a part of the climate change programs put in place by various local entities. Such a strategy also has the benefit of clarity of message when communicating both to internal stakeholders (such as employees) and to citizens in general; concentrating on an energy-reduction message means that local governments and businesses will not be competing with the prevailing environmental concern of climate change. It is reasonable to expect, for example, that the public is much more aware of greenhouse gases, their sources and impacts, than they are of particulate matter and even ozone. Therefore, integrating a PM 2.5 strategy into a greenhouse gas strategy avoids the risks of a competing environmental message.

Further, such a strategy is more likely to be adopted and implemented by necessary stakeholders within various local groups, such as city councils, county boards, physical plant managers and the like, all of whom are already inclined from both market and public pressure to seek out and implement sustainable practices. Stakeholders may be more eager to dedicate their agencies to the success of these efforts if they feel they are getting a two-for-one benefit in both greenhouse gas and particle pollution reduction.

Concentrating on energy reduction is not a silver bullet, however. For one, the link between *local action* on energy reduction and *local reduction* of PM 2.5 produced by distant sources is not clear. Since a carbon footprint is measured in global, rather than local, impact, a highly successful program of energy efficiency that reduces consumption by, for example, 30%, will not necessarily reduce PM 2.5 production by a proportional amount. Power plants are, after all, generating electricity for hundreds of thousands of households, of which Roanoke's consumption may be only a small percentage. While our energy reduction efforts might be successful on a global scale, our air might be just as polluted from coal burned to generate power for all those other households, particularly if localities upwind from us are not as conscientious in their energy consumption as we are. In other words, local air quality could remain unchanged or even *deteriorate* under a successful climate change mitigation program, depending on the actions of outside municipalities and businesses. It's also important to remember that, while the ramifications for climate change are serious and far-reaching, the gap between cause and effect on the local level is large: a community still runs the risk of suffering from the ramifications of global climate change in the form of natural disaster even if it has been successful in reducing its GHG emissions. In the realm of public health, greenhouse gas emissions do not have nearly the same negative impact on a local population, both in terms of extent and immediacy, as either particulate matter or ozone.

The reverse can also be true: a strategy that has a direct effect on PM 2.5 may have no effect whatsoever on greenhouse gases. Take, for example, one of the current strategies for addressing ozone: requiring municipal fleets to only refuel after dark and encouraging the public to do the same. As an Air Quality Action Day strategy, this has been successful in avoiding spikes in ozone levels during the hottest days of the past few summers due to its simplicity and immediacy – its an action that can be taken *right now* that has an effect on ozone production *right now*. However, it clearly has no impact on greenhouse gas emissions – the fuel is still being pumped, burned, and emitted. Attacking Air Quality Action Days with a strategy of energy reduction – don't drive at all – would affect both PM 2.5 and GHG, but it is not clear that it would be a realistic or effective strategy.

What becomes obvious, therefore, is that an education plan that concentrates on climate change and energy reduction as a strategy for addressing particulate matter, while benefiting from synergy with existing environmental messages, runs the danger of being ineffective for reducing local PM 2.5.

Strategies

The following strategies have been identified as possible approaches to local PM 2.5 pollution.

Strategy: *Broaden Air Quality Action Day email list message*
Description: One of the strategies for the Ozone Early Action Plan was the creation of an Air Quality Action Day email list. Representatives of local governments, businesses, and private citizens could subscribe to this list and receive notification of Code Orange and Code Red ozone pollution days as forecasted by DEQ. The email would notify recipients of the forecast and suggest strategies that could be implemented that would have an immediate mitigating effect on

ozone. The Commission has already used this list to promulgate information about PM 2.5, primarily using the same strategies suggested to mitigate ozone pollution. The list could be expanded to include fine particulate matter as an official trigger and could include energy efficiency as part of the suggested strategies (reducing air conditioning use, careful attention to unnecessary lighting, etc.).
Primary impact(s): Ozone
Secondary impacts(s): PM 2.5, GHG
Measures: None

Strategy: *Expand Air Quality Action Day email list membership*
Description: Partner with businesses, through the RIDE Solutions Workplace program, by working with the new Environmental Leadership Coalition headed by the City of Roanoke and Breakell Inc., and through other means, to expand membership in the Air Quality Action Day list. Encourage list recipients to forward emails on within their organizations.
Primary impact(s): Ozone
Secondary impacts(s): PM 2.5, GHG
Measures: Growth in recipient list.

Strategy: *Compact Fluorescent Light Bulb (CFL) Giveaway and Education Program*
Description: Roanoke Valley Cool Cities Coalition already has a major CFL distribution program. RIDE Solutions has a smaller, but active program. These efforts should be continued, with additional support from local governments and private businesses in the form of donations – of money or bulbs – to Roanoke Valley Cool Cities Coalition.
Primary impact(s): GHG
Secondary impacts(s): PM 2.5
Measures: Distribute 6,000 bulbs by 2010. Using www.18seconds.org as a measurement tool, have 20% of all light bulbs in the Roanoke region made up of CFLs. Goal to be set by (number of households * average bulbs per house) * .20, with all numbers current as of 2010.

Strategy: *Voluntary Anti-idling Campaign*
Description: Starting with pledges from local governments, expand voluntary pledge system to businesses and private citizens to reduce or eliminate idling. Recruit champions from local businesses who can speak to the financial impact of anti-idling (for example, Cox Communications has implemented an anti-idling campaign and has seen significant cost savings from their fleets). Provide information, tools (such as an online calculator or worksheet), and promotional materials (perhaps through the It All Adds Up To Cleaner Air campaign) to distribute to businesses.
Primary impact(s): PM 2.5, Ozone (during the summer)
Secondary impacts(s): GHG
Measures: Unknown

Strategy: *Regional Education Campaign*
Description: Create a single, branded, regional website (along the lines of the City of New York's GreenNYC site, http://nyc.gov/html/planyc2030/html/greenyc/greenyc.shtml) that bundles many of the above strategies, tools, and information into a single portal. MPO member localities and agencies would provide access to media outlets such as RVTV and support for the creation of PSAs to be distributed via local media. Media campaign can drive people to the website where they can get information, take participation pledges, learn about regional events

(such as the Green Living Expo, Clean Commute Day, CFL Distributions, Air Quality Action Days, etc.). Website could be supported by information and input from stakeholders, created and managed by Regional Commission staff. Though the website would concentrate initially on PM 2.5, with energy efficiency as a major theme, it could be expanded to include water quality, recycling, and other regional issues.
Primary impact(s): GHG
Secondary impacts(s): PM 2.5, Ozone
Measures: Website traffic; counts of submissions of various forms (pledges taken, CFLs, installed, registrations to RIDE Solutions, etc.)

Strategy: *Training Opportunities for Local Business Leaders*
Description: Provide training on PM 2.5 related issues through workshops, forums, webinars, and other outlets. Biodiesel for local businesses seems to be of particular interest, but perhaps a series of training opportunities can be taken, organized by the Commission, under the umbrella of the City's Clean and Green campaign, or some other method.
Primary impact(s): PM 2.5, Ozone, GHG (depending on the training course offered)
Secondary impacts(s): PM 2.5, Ozone, GHG (depending on the training course offered)
Measures: Training session attendance, follow-up (RIDE Solutions Workplace partnerships, anti-idling pledges, etc.)