TITLE:	Estimating the Health Benefits of Reducing Emissions of Toxic Air Contaminants in California
CONTRACTOR:	University of California, Davis
PRINCIPAL INVESTIGATOR:	Mark Delucchi, Ph.D.
CONTRACT TYPE:	Interagency Agreement
BUDGET:	$349,857
CONTRACT TERM:	24 Months

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I. SUMMARY

One of California's critical air quality goals is to reduce the public's health risk from exposure to airborne toxic chemicals. To achieve the goal, the California Air Resources Board (CARB) is prioritizing the evaluation and reduction of exposure to toxic air contaminants (TACs). The Community Air Protection Act, Assembly Bill (AB) 617, aims to reduce exposure in communities that experience high cumulative exposure to air pollution, including TACs. The Air Toxics Hot Spots Information and Assessment Act, AB 2588, requires commercial facilities to report their air toxics emissions, identifies facilities that pose significant health risks, and reduces the emissions from these facilities. Air pollution control efforts driven by state and federal law require reductions in pollution sources that contribute to criteria pollutants such as particle pollution and ozone, but many of these sources also contribute to toxic emissions. Under AB 2588, CARB performs health risk assessments (HRAs) of TACs. The Air Toxics Hot Spots Program Guidance Manual, established by Office of Environmental Health Hazard Assessment (OEHHA), recommends exposure variates, cancer and non-cancer health values, and air modeling protocols needed to perform these HRAs. These HRAs estimate the incidence of cancer and non-cancer impacts of TACs, but they do not provide a mechanism to estimate the monetary value of these impacts. Developing the methodology to identify specific health outcomes from toxic emissions and estimate the monetary value of these

health outcomes, including cancer and non-cancer impacts, will enable CARB to better assess and estimate the value of health benefits generated from existing and proposed rules and regulations affecting TACs.

To help advance CARB's critical air quality goal of reducing the public's health risk from exposure to airborne toxic chemicals, this project will provide methods, data, and results for valuing the health effects of TACs to allow CARB to assess the benefits of toxics reduction scenarios. For example, CARB will be able to extend its health analysis of rules and regulations to include estimates of the benefits of reducing TACs including benefits of reducing cancer and non-cancer impacts of toxic chemicals. The researchers will work with CARB to develop and demonstrate a complete emissions-through-benefits model to estimate the benefits of TAC emission-reduction scenarios. This model will include a significant expansion of the Benefits Spreadsheet Model (BSM), which is slated to be developed under another CARB contract. The enhanced model developed under this contract, designated as the BSM+TACs, will provide a more comprehensive, detailed, Census-Tract (CT)-scale estimate of TAC emissions, exposure, health impacts, and costs, and will allow CARB staff to estimate the health benefits of TAC emission-reduction scenarios that advance CARB's goals of reducing public health risks from TACs and improving air quality on a regional and statewide basis.

II. TECHNICAL SUMMARY

Objective

This project will support CARB's efforts to reduce the public's health risk from exposure to airborne toxic chemicals. The main objectives of this project are:

1) To develop methods to evaluate health impacts and place a monetary value on the health impacts of TACs;
2) To demonstrate how the methods can be used to estimate the health benefits of TAC emission-reduction scenarios; and
3) To develop an enhanced benefits spreadsheet model (BSM +TAC) to be able to better model the health benefits of TAC emission-reduction scenarios and provide results at a finer geographic scale.

Background

Exposure to air pollution is associated with a number of adverse health outcomes such as heart and lung disease. Toxic air pollutants emitted from mobile sources and industry sectors can also pose adverse health impact such as elevated cancer risk. For example, because diesel exhaust contains more than 40 cancer-causing substances, in 1998 California identified diesel particulate matter (PM) as a TAC. As mentioned above, CARB's HRAs can estimate changes in cancer risks, but they do not estimate the possible disease outcomes and the dollar value connected to these disease outcomes.

The Contractor has a current contract (here referred to as the "CPAT project") with CARB to develop the BSM, entitled "Developing a Comprehensive Framework for Estimating the Social Costs of Emissions of Criteria Pollutants and Air Toxics in California, and Identifying Other Direct and Indirect Benefits of California's Climate and Air Quality Programs". The focus of the BSM in the CARB CPAT project is to estimate the benefits of changes in emissions of criteria pollutants in California, at the county level. The proposed BSM does address about 8 TACs, but most of them are co-emitted with the criteria pollutants from major combustion sources (power plants and motor vehicles) and is slated to have a simplified treatment of a few "co-emitted" TACs at the regional scale. This proposed project, BSM+TACs, will evaluate the suitability of including the 100+ TACs listed in OEHHA. The BSM developed for the CARB CPAT project thus is not capable of estimating the detailed, local-scale, health benefits of the much wide range of TACs regulated by CARB. Therefore, for this project, the Contractor proposes to significantly expand the treatment of TACs in the BSM, as discussed in the Project Summary below.

Project Summary

In order to develop methods and data to estimate the dollar value of cancer and non-cancer changes in the health impacts of TACs, the Contractor will: 1) develop lists of TACs, emission sources, cancer and non-cancer health impacts for the analysis;
2) review the literature on valuation and health effects of TACs; 3) develop dose-response functions; 4) value TAC health impacts and convert the impacts to disability-adjusted life-years (DALYs) and value the DALYs; 5) include costs of medical care and prevention, lost productivity, and pain and suffering and reduced or lost quality

of life (LQOL); and 6) develop and justify appropriate social discount rates in the valuation.

In addition, to demonstrate how the valuation methods can be used to estimate the health benefits of TAC emission reductions, the contractor will: 1) apply the valuation methods and data to estimate the dollar value of CARB's estimates of cancer and non-cancer impacts; 2) use BSM+TACs to calculate monetized health impacts for toxics reduction scenarios; and 3) engage with community groups to get input regarding TAC-emission-reduction policy scenarios.

The contractor will develop the enhanced version of the BSM, BSM+TACs, to provide Census Tract (CT)-level estimates of the health benefits of reducing emissions of a wide range of TACs. The enhanced spreadsheet model will greatly increase the number of TACs considered, include a wider range of health impact measures and functions, estimate benefits at the CT rather than the county level, include a TAC exposure module and an in-depth analysis of valuation methods. A major part of the expansion of the BSM is to revise the BSM air-quality model to estimate exposure to TACs at the local level, down to the CT. BSM+TACs will be fully documented and peer-reviewed. It will have a user interface that CARB staff can manipulate easy to perform scenario analyses pertinent to CARB's regulations.

The contractor will reach out to community groups to assist in reviewing the toxics and cancer health impact assessment and valuation findings, recommending policy scenarios for analysis with BSM+TACs, and holding working sessions with interested community members to demonstrate the use of the tool to evaluate health benefits of reduced toxic emissions.

III. STAFF COMMENTS

The contractor, Dr. Delucchi, and his team have extensive experience in estimating the health benefits of reducing emissions of air pollutants. Dr. Delucchi and Dr. McCubbin have published seminal work estimating the air-quality benefits from the use of transportation fuels in the US. A unique part of that work was performing a detailed analysis of the health effects of emissions of TACs from motor vehicles, using state-of-the-art methods to estimate TAC emissions, air quality, exposure, effects, and valuation. The investigators will build on this expertise for this project.