COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
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DRAFT
Assessment of Construction and Demolition
Derived Wood Used for Fuel
6/1/10

I. BACKGROUND AND OBJECTIVES

At the direction of the Secretary of Energy and Environmental Affairs, the Massachusetts Department of Environmental Protection (MassDEP), in consultation with the Massachusetts Department of Public Health (MDPH), is evaluating the potential public health and environmental impacts related to the generation of electricity by using wood derived from construction, renovation and demolition (C&D) wastes as fuel. There are two primary objectives for this evaluation:

(1) to determine whether the public health and environmental impacts posed by facilities combusting or gasifying these wastes[1] for energy generation would be significant, and, based on this evaluation, whether MassDEP should entertain permit applications for the use of C&D wood as a fuel for the production of energy; and

(2) if MassDEP decides to entertain permit applications for these facilities, to identify the supplemental data and analyses that would be needed to evaluate the potential public health impacts of a specific facility in a MEPA filing or a permit application.

This evaluation is generic, and will not consider the characteristics of specific sites for which these facilities have been proposed or are being considered. If MassDEP decides to entertain such applications, any application submitted will be evaluated in the context of relevant project and site-specific conditions.

To assist in this effort, MassDEP is seeking proposals from consultants to complete the following tasks. There are three parts to the generic evaluation, which are summarized below:

[1] There are several technologies that create electricity from C&D wood, including direct combustion and gasification prior to combustion. Subtask 5 in Task 1 describes the specific types of technologies that will be addressed by this evaluation.

This information is available in alternate format. Call Donald M. Gomes, ADA Coordinator at 617-556-1057. TDD# 1-866-539-7622 or 1-617-574-6868.

MassDEP on the World Wide Web: http://www.mass.gov/dep
Printed on Recycled Paper

Task I: Complete a State of the Science and Gap Analysis Report.

The selected consultant will complete a State of the Science Report that documents, summarizes and evaluates available information on the possible environmental and health impacts and benefits of using C&D wood as fuel for energy generation. Specific elements to be included are discussed in more detail in Section XI below. The major elements are:

1. the types and levels of contaminants commonly found in C&D wood;
2. sampling protocols appropriate to characterize toxics and other contaminants of concern in C&D wood feed stocks;
3. the most effective options for reducing and mitigating toxics and other contaminants of concern in C&D wood feed stocks;
4. potential emissions of greenhouse gases and other air pollutants related to combustion or gasification of C&D wood both before and after the application of state of the art air pollution controls;
5. potential public health impacts, including a comparison with National Ambient Air Quality Standards (NAAQS), MassDEP Air Toxics guidelines, and other equivalent values associated with the combustion and or the gasification of C&D wood; and
6. development of a standard specification for C&D wood to be used for fuel .

To prepare this Report, the consultant will review available state, federal, academic, international and private sector reports, data bases, assessments, guidance documents, and permits issued in other jurisdictions, as well as any other relevant sources of information. The contractor will document and evaluate available reports and identify any significant gaps in information and options for addressing them, which may include: gaps in data describing C&D wood feedstock contaminants and air emissions associated with the combustion or the gasification of C&D wood fuel; information on risk reduction/mitigation options; modeling of potential exposures; and assessment of potential risks and benefits. Any sampling and analysis of samples may be performed under an additional task issued under this contract.

Task II: Generic Risk Assessment

The consultant will develop a generic assessment of the public health and environmental impacts associated with the use of C&D wood as fuel for electricity generation. The assessment will use one or more hypothetical "state-of-the-art" facilities and locations that will be developed in consultation with MassDEP and MDPH. The assessment will use the fuel specification developed in Task I, combustion parameters, air pollution and other engineering controls, meteorological data, assumptions about the size and type of the hypothetical facility, receptors, and other factors as necessary.

The assessment will first examine risks resulting from the inhalation route of exposure, and will determine whether Massachusetts air quality standards and guidelines, and other equivalent guidance, would be met by the hypothetical facility. Total cancer risk and noncancer risk will be estimated and compared with MassDEP's criteria of a Hazard Index of 1 and Excess Lifetime Cancer Risk of one-in-a hundred thousand (1×10^{-5}). If the assessment determines that all appropriate standards, guidelines and risk criteria would be met for the inhalation route of

exposure, the assessment would then examine risks associated with the ingestion route of exposure.

Based on the results of Tasks 1 and II, MassDEP will decide whether to entertain applications for the use of C&D wood as a fuel for the generation of electricity.

Task III: Recommendations for supplementing current requirements for data and analyses for MassDEP permit applications and MEPA filings.

If MassDEP determines, on the basis of the information and recommendations developed in Tasks I and II and any other information available to the Department, that the agency should entertain permit applications for facilities using C&D wood for electricity generation, the contractor will be directed to perform Task III.

Based on instructions from MassDEP, as well as the results of the State of the Science Report, the consultant will identify data needs and assessment options for MassDEP's consideration and potential inclusion in project-specific permit applications (in addition to the data and analyses that are currently required), so that MassDEP could determine whether a proposed facility would or would not significantly impact public health or the environment.

MDPH has been awarded funds from Robert Wood Johnson Foundation to conduct a Health Impact Assessment (HIA) in Springfield, MA. If the assessment of C&D suggests that DEP should "entertain permit applications" for proposed facilities, MDPH will work with the contractor to identify health data analyses to be conducted.

In addition, the consultant will identify specific conditions or combinations of conditions that relate to the technology proposed to be used by a new facility and the characteristics of the area in which the new facility would be located that would trigger the inclusion of specific information in a permit application (e.g., certain routes of exposure to contaminants of concern might only be evaluated when specific health or environmental conditions are found in the area that would be affected by emissions from a proposed facility).

In a separate task (**Task IV, Public Participation),** the scope of work establishes that the consultant will participate in public meetings that MassDEP will organize to present the results of this assessment to the public and to obtain public comment.

II. SINGLE OR MULTIPLE DEPARTMENT USE

This is a single agency procurement for MassDEP only.

III. DURATION

The duration of this contract will be 26 weeks and is expected to begin in [insert month], 2010.

IV. ACQUISITION METHOD

The acquisition method for this RFR is "Fee for Service".

V. ANTICIPATED FUNDING

MassDEP anticipates that this RFR will not exceed $150,000, but proposals in excess of this amount will be considered. MassDEP will compensate the consultant on an hourly basis. A detailed workplan for each task will be developed prior to the start of work. Each workplan will include an estimate of the hours needed to complete the task that will be negotiated with the consultant.

VI. SINGLE OR MULTIPLE CONTRACTORS

MassDEP plans to award one contract. This award will depend upon the Department's needs, the market, the availability of bidders and other factors. All bids must include the total cost of services to be provided.

MassDEP encourages bidders to build teams with specific areas of expertise and work collaboratively with qualified sub-contractors to complete the scope of work.

VII. FORM OF RESPONSE

All responses must meet the requirements outlined in this RFR. One (1) paper original and a total of five (5) paper copies should be submitted in a sealed envelope labeled RFR Response to:

James C. Colman
Assistant Commissioner
Bureau of Waste Prevention
Massachusetts Department of Environmental Protection
1 Winter Street
Boston, MA 02108
james.colman@state.ma.us

VIII. SCHEDULE AND SUBMISSION PROCESS

All inquiries from potential bidders must be submitted electronically to James C. Colman at the contact information listed in Section VII above. Responses to questions will be posted on Comm-Pass.

All responses to this RFR are due by 5:00 p.m. on XXXXX, 2010. Any response offered for filing after 5:00 p.m. on XXXXX, 2010 shall be refused. Facsimile filings of any response shall also be refused. No bidders' conference is scheduled for this RFR.

Schedule: To be determined, will include the following steps:

- Issue RFR to Comm-PASS
- Question and answer period

- RFR due
- Winning bidder selected
- Contracts negotiated
- Initiate project work
- Project duration – 26 weeks

IX. PROPOSAL DESCRIPTION

When submitting a proposal, respondents will be required to provide at least the following information:

- A cover letter;
- An executive summary;
- Qualifications of the management team and all staff contributing to the tasks described in this Scope of Work, including resumes and details describing past experience in the area of expertise;
- Detailed description of the respondent's approach to address each of the tasks identified in the Scope of Work. Descriptions should not merely re-state the scope of work, but describe the specific approach, data, and experience the bidder will utilize to successfully and fully address the issue;
- Identify the key tasks and deliverables to be provided for each task of this scope;
- Project plan, including schedule, milestones for each task, and responsible personnel;
- Outreach, including a discussion of how the proposal will approach stakeholder outreach and public information meetings as laid out in the scope of work;
- Describe experience on prior projects of a similar nature. Preference will be given for a consultant with knowledge of the New England C&D industry and markets. Respondent should provide three references.
- Financials and Timeline forms (see separately attached excel spreadsheet budget and project timeline forms, labeled ―Budget and Timeline forms: Biomass Sustainability and Carbon Policy Study).
- Additional information related to proposed evaluation criteria set forth below, including an Affirmative Market Plan.

X. EVALUATION CRITERIA

MassDEP will use the following evaluation criteria to evaluate proposals. For each criterion, it is expected that Responses will provide sufficient details both data and methodology to allow the agency to evaluate the Response.

[Note to Reviewers: Evaluation criteria are being developed, but will include at a minimum the following types of criteria:

- The consultant's and subcontractors' demonstrated knowledge of the subject of this solicitation;
- The consultant's and subcontractors' demonstrated experience in conducting the types of analyses required for this project; and

- The consultant's ability to manage projects of this type and to provide clear and thorough deliverables in accordance with the project schedule.]

XI. SCOPE OF WORK

TASK I: State of the Science and Gap Analysis Report

Subtask 1: C&D material overview.

The consultant will summarize the types and quantities of C&D materials that are currently generated in New England and New York and, more specifically, in Massachusetts, based on a review of existing scientific and technical literature and other existing documents, including but not limited to the references included in Appendix A. The consultant will provide the following information in its Report:

- A general description of Construction, Renovation and Demolition (C&D) activities;
- A description of the types of C&D materials generated from C&D activities;
- The overall quantities of C&D materials generated; and
- The relative quantities of C&D materials generated, including but not limited to the following categories: inerts (dirt, rock, concrete, brick, metals, etc.); biomass-based materials (e.g., wood, paper and cardboard); and non-biomass organic materials (e.g., plastics, asphalt shingles, etc.).

Subtask 2: Generation, handling and processing of C&D wood.

The consultant will complete an analysis of the activities currently involved in handling C&D waste materials to produce C&D wood fuel

1. Site of Generation
   - Provide a description of how C&D wood is produced at the site of generation during construction, renovation and demolition activities.
   - Identify practices that are used at the site of generation to separate, segregate, sort, process and/or store C&D wood.
   - Identify state-of-the-art methods for storage, sorting, segregation, and on-site processing of C&D wood at the site of generation, and evaluate the cost, practicality (including space, equipment, educational needs, etc.) and effectiveness of implementing these methods.
2. C&D Processing Facilities
   - Provide a description of how C&D wood is handled or processed at facilities specifically designed to separate, sort or otherwise process C&D materials (C&D processing facilities) including identifying the equipment, methods, and technologies currently used at C&D processing facilities.
   - Identify state-of-the-art methods for storage, sorting, segregation, and on-site processing of C&D wood at C&D processing facilities, and evaluate the cost, practicality (including space, equipment, educational needs, etc.) and effectiveness of implementing these methods.

3. Identify the different types and quantities of wood material generated from C&D activities in New England and New York, including but not limited to:
   - Green wood that is typically found in C&D debris (e.g., from land-clearing activities);
   - Unadulterated wood (e.g., dimensional lumber, pallets, crates, spools, etc.);
   - Adulterated wood, which will include (but is not limited to):
     - Engineered or manufactured wood products: wood containing glues, binders, or resins such as plywood, fiberboard, particle board, chipboard etc.
     - Composite wood materials: wood products containing non-wood materials such as wood laminated with plastics or vinyl or wood/plastic compositions such as Trex®;
     - Painted or stained wood: wood treated with paints or stains (lead-based paint, oil and water-based painted or stained wood);
     - Treated wood: wood treated with preservatives such as creosote, pentachlorophenol, and copper chromium arsenate; and wood treated with pesticides or fungicides.
   - Identify non-wood materials (e.g. plastics, gypsum, dirt/grit, etc.) likely to be attached or otherwise "carried over" during the production of C&D wood fuel to the C&D wood fuel pile.

Subtask 3: Characterization of Both Pre-Sorted and Post-Sorted C&D wood fuel.

1. Based on an analysis of existing data and the literature on the physical and chemical composition of the various types of pre-sorted wood materials and post-sorted wood materials currently generated during C&D activities, the consultant will:
   - For each category of pre-processed C&D wood listed in Subtask 2 and non-wood materials, identify and summarize existing information and data on toxic constituents, including hazardous constituents known as "RCRA Appendix VIII" compounds[2], Hazardous Air Pollutants[3], and other potential Contaminants of Concern ("COCs").
     - For adulterated wood, identify the chemicals by trade name, generic name and CAS number, used to treat or manufacture adulterated wood materials, such as, but not limited to, caulking, paints, stains, glues, and preservatives. Include the quantity of such additives typically added to wood products on a weight per area basis and, if possible, on a weight to weight basis.
   - Based on the research above or other available information, determine if all likely COCs have been identified.
   - If existing data is adequate for this project (i.e., is statistically sufficient, which will be determined in consultation with MassDEP), calculate the expected concentrations of "RCRA Appendix VIII" compounds, Hazardous Air Pollutants, and other COCs in post-processed C&D wood fuel, considering the relative quantities (percentage) of each C&D wood category listed in Subtask 2 and their associated contaminant level. The contractor will identify appropriate statistical methods and recommend for MassDEP approval which method(s) should be used for this analysis.

[2] This list has been codified in the Massachusetts Hazardous Waste Management Regulations at 310 CMR 30.160, Hazardous Constituents".
[3] 1990 U.S. Clean Air Act Amendments, Section 112(b)(1)

- Develop the contaminant contribution to C&D wood fuel from non-wood materials carried over into the post-processed C&D wood pile, based on the likely percentages of carried over materials, at de minimus, 1%, 3% 5%, and estimated carry over rates developed in Subtask 2.
- Compare and contrast the expected contaminant loading in post-processed C&D wood fuel derived from the literature review with any results of actual testing of post-processed C&D wood fuel identified in Subtask 3.
- Evaluate and analyze the information above and develop a baseline of the average concentrations and ranges expected for "RCRA Appendix VIII", Hazardous Air Pollutant compounds, and other COCs in post-processed C&D wood fuel.
- If existing data is not adequate for this project (determined in consultation with MassDEP), provide recommendations for methods to collect representative samples of post-processed C&D wood fuel (including "carry over" materials), and to analyze the samples (both physically and chemically). Recommendations should include the costs associated with such sampling and analysis. Appropriate quality assurance/quality control elements should be addressed. The Department will decide whether supplemental sampling and/or analysis is needed, and if so, if and how to proceed with these additional tasks.
- Define the average heating value, nitrogen content and moisture content for green wood, adulterated wood and unadulterated wood.
- Quantitatively compare the levels of contamination currently likely to be present (as identified in previous steps) in each type of C&D wood (green wood, the categories of unadulterated wood identified above, the categories of adulterated wood identified above, and post-processed C&D wood fuel).

2. Handling and Processing Evaluation
   - Evaluate how differences in handling and processing methods and technologies influence the variability of characteristics of C&D wood produced, taking into consideration both the current methods used to separate wood and improved methods that may be available. Include in the evaluation how the carry over of non-wood materials is affected by the various sorting methods and technologies.

Subtask 4: Develop C&D wood fuel specification and QA/QC procedures for ensuring that the specification is met

The consultant will develop a specification for C&D wood to be used as fuel that will:

- Minimize the amounts of "RCRA Appendix VIII" compounds, Hazardous Air Pollutant compounds, and other COCs in C&D wood fuel;
- Reliably produce a consistent product;
- Be practically implementable in the context of the C&D waste management industry, i.e. physically achievable and cost effective; and
- Be verifiable using standard methods for QA/QC.

The fuel specification will be based upon an analysis of the methods and procedures that are currently used, as well as improved methods and procedures that could be used, to ensure that C&D wood produced during the generation, processing or handling of C&D wood will meet the specification for that material's intended use as fuel.

Specification Recommendation:

- Identify the specifications currently used to characterize C&D wood to be used as a fuel and produced during C&D waste generation, processing or handling activities.
- Identify revisions or improvements in the current specifications that will enable C&D wood to meet the goals described in the introduction to this Subtask.

Quality Control/Quality Assurance at the Site of Generation:

- Identify all methods, techniques and equipment etc. (visual inspection, physical analysis, chemical testing, etc.) currently or typically used to monitor, inspect or test C&D wood to ensure that the wood meets the specifications that the consultant is proposing to MassDEP for the use of C&D wood as fuel.
- Evaluate the level of confidence in existing monitoring methods relative to producing C&D wood consistent with these specifications.
- Identify and evaluate additional methods, techniques and equipment that could be used to monitor, inspect or test C&D wood for quality control/quality assurance purposes.

Quality Control/Quality Assurance at the Location of Use:

- Identify all methods, techniques and equipment etc. (visual inspection, physical analysis, chemical testing, etc.) currently or typically used to monitor, inspect or test C&D wood to ensure that the C&D wood meets the proposed specifications for the use of C&D wood as fuel.
- Evaluate the level of confidence in existing monitoring methods relative to producing C&D wood consistent with its specification.
- Identify and evaluate additional methods, techniques and equipment that could be used to monitor, inspect or test C&D wood for quality control/quality assurance purposes.

Subtask 5: Review combustion and gasification technologies that may use C&D wood fuel and identify products of combustion.

The consultant will review combustion, gasification and other energy generation technologies that may use C&D wood as fuel, and compare their respective potential emissions of criteria and non-criteria air pollutants including COCs specific to C&D wood fuel, potential secondary combustion by-products associated with combustion of C&D wood fuel, and greenhouse gases (GHGs). GHG emissions will be determined either per thousand pounds of steam or per Megawatt hour produced net, as applicable.

The consultant's evaluation should include, but not be limited to:

- excess-air grate or suspension-firing with steam-electric generation;
- fluidized-bed combustion with steam-electric generation;
- plasma gasification and combustion of gas for steam-electric generation; and
- other technologies that are being used to generate energy by combusting or gasifying C&D wood fuel (either at full scale or pilot scale installations).

Subtask 6: Review Add-On Control Technologies at Facilities Using C&D Wood as Fuel or as a Raw Material for Gasification.

The consultant will include a review of add-on air pollution control technologies that have achieved emission reductions of COCs in practice at facilities combusting or gasifying C&D wood as well as clean wood, Municipal Solid Waste (MSW) and other feed stocks. Available emissions test data, using USEPA Reference Test Methods at 40 CFR 60-Appendix A, should be identified and evaluated. The consultant's evaluation should include, but not be limited to the effectiveness of the following, both singly and in combination, in reducing emissions of COCs:

- fabric filtration;
- electrostatic precipitation;
- oxidation;
- reagent injection, with and without catalytic reduction; and
- adsorption/absorption (scrubber).

Subtask 7: Greenhouse gas emissions from using C&D wood as fuel

The consultant will assess the GHG emissions from using C&D wood as a fuel identified in Subtask 5 by comparing these emissions to GHG emissions generated by combustion of fossil fuels per the same unit of energy output. Also, the consultant will evaluate GHG emissions of other C&D management methods per unit product for C&D wood. The following should be evaluated:

- Fossil fuel combustion to produce either steam or electricity including natural gas, fuel oil and coal combustion;
- Use of C&D wood in the manufacture of particle board at facilities such as Tafisa in Quebec;
- Combusting C&D wood as fuel at out-of-state facilities in Maine;
- Landfilling C&D wood, both in-state and out-of-state; and
- Other uses of C&D wood.

Subtask 8: Comparison of Non-Greenhouse Gas Emissions.

The consultant will compare the potential emissions of criteria and non-criteria pollutants (except GHGs) from using C&D wood as a fuel that were identified in Subtask 5 to the emissions from using fossil fuels (coal, oil, natural gas) for power generation per the same unit of energy output.

Subtask 9: Potential public health impacts.

The consultant will identify and review available information and assessments on the potential public health impacts of combustion and/or gasification of C&D wood fuel. This review should include summaries of any assessments completed to date in MA, other states or elsewhere, and include available information addressing the issues listed below.

- Hazard identification: The report should:
  - Identify and evaluate methods and criteria used to identify and select each chemical of concern (COC), including post-combustion COCs.
- Toxicity Assessment. The report should include a summary of available toxicity data and guidelines for each COC, identifying the values, toxicity endpoints and sources of information.
- Exposure Assessment. The report should:

  - Identify and summarize any available emissions testing data including sampling and analytical methods used; compounds included; testing frequency; etc.
  - Identify and assess any exposure modeling completed, including efforts to address direct inhalation exposures as well as indirect exposure pathways (e.g. food chain).
- Risk Evaluation: The consultant should identify, summarize and evaluate:
  - Assessments that have evaluated compliance with emission standards;
  - Assessments of maximum ground level concentrations of applicable criteria and non-criteria air contaminants obtained using USEPA approved computer dispersion modeling attributable to C&D combustion and or gasification with state and federal air limits/guidelines.
  - Other assessments of risks.

Task II: Generic Risk Assessment

The consultant, working with MassDEP, will develop parameters for a generic public health assessment focused on health risks at hypothetical facility scenarios. The assessment will look at the fuel specification developed in Subtask 4, technical controls, meteorological data, size and type of a facility and other factors as are necessary.

Emissions of COCs will be modeled to predict ambient air levels at the facility property line, maximum point of impact and at locations frequented by sensitive receptors (i.e., schools). Compliance with NAAQS, Massachusetts air guidelines (AALs) will be evaluated. For COCs that do not have MA standards or guidelines, equivalent values from EPA, ATSDR, Cal EPA, etc. will be used. If a chemical does not have an air standard, guideline or an equivalent value, the contractor should develop an air guideline using MassDEP's guidance for developing an air guideline, which includes using the AAL derivation process or "structure activity" analysis if necessary. Predicted levels will be compared to standards and guidelines to determine if they are met or not**.**

The consultant will also compute a total Hazard Index for non-carcinogens and the total excess lifetime cancer risk for carcinogens emitted by the hypothetical facility.

If the generic assessment indicates that Massachusetts air standards and guidelines can be met, then the consultant would evaluate the ingestion pathway for lead, arsenic, and mercury, which are metals that are of particular concern in areas of the Commonwealth. This evaluation would include consideration of the source's contribution of lead and arsenic to soil, and of mercury to water bodies and ultimately fish.

The generic assessment of the ingestion pathway would focus on emissions of mercury, lead and arsenic from the stack, lead and arsenic deposition to soil, their contribution to children's exposure via ingestion, and associated health impacts. It would also consider mercury deposition into a hypothetical pond and its uptake into fish. Results would be compared to MassDEP soil standards and fish consumption trigger levels. As part of MDPH's health impact assessment,

MDPH would review the soil lead data in comparison to areas affected by facility emissions that also have an elevated number of children with blood lead poisoning.

The consultant will consider whether additional COCs should be included in the ingestion pathway assessment and if so, will identify criteria that could be used to guide this decision. For example, COCs likely to be emitted from a facility and that have highly elevated bioaccumulation factors might warrant inclusion as could persistent bioaccumulative toxics ("PBTs") emitted above some annual emission threshold (e.g. TURA reporting thresholds), etc.

The consultant will develop recommendations as to the significance of the ingestion pathway in assessing the overall risk that a facility may pose to public health and the environment, and, if this route of exposure is determined to be significant, to identify conditions that should trigger an evaluation of this pathway as part of MassDEP's review of permit applications for specific facilities..

Air Impact Analysis for a C&D Facility

Purpose and Approach

An impact analysis of air emissions from an electrical generating facility fueled by construction and demolition (C&D) wood waste in Massachusetts will be performed for the purpose of providing inputs to a study estimating risk such facilities could pose to public health and the environment. To this end, the consultant will perform modeling and develop impact analyses for two hypothetical facilities "sited" at three locations within the Commonwealth (for a total of six hypothetical facilities). Facility impacts at these locations are expected to differ because of local factors such as terrain, land use, and meteorology, which all affect the dispersion environment. Existing ambient background concentrations, which will also differ, will be added to these facility impacts. Modeling results will then be incorporated into the risk analyses.

Hypothetical Facilities

The study will evaluate impacts from two hypothetical facilities of typical capacity. One will reflect current combustion technology, the other the most advanced lowest-emitting combustion process. Both will employ add-on controls that constitute Best Available Control Technology (BACT). These will be selected from the options identified in Sub-Tasks 5 and 6. Stack height and other stack parameters should be typical for such facilities, but only a stack of Good Engineering Practice (GEP) height, as defined by USEPA, should be considered.

The consultant will "site" these facilities at three locations across the state: south coastal, eastern or northeastern MA, and western MA (most likely the CT Valley.) This will necessitate the use of different meteorological datasets for each location. Upper air data from Chatham, MA, Gray, ME, and Albany, NY would be used for south coastal, eastern/northeastern, and western MA locations, respectively. More options exist for surface meteorological stations and their choice would depend on the facilities' location and the availability of representative data. For this, the consultant will confer with MassDEP. Although the facility locations would be hypothetical, the study would apply real source and receptor locations and use actual associated terrain data.

Model

The consultant will apply AERMOD, an EPA recommended air dispersion model, in accordance with Massachusetts and EPA Guidance (40 CFR Part 51 Appendix W) to estimate the hypothetical facilities' impact on ambient air and potentially on soil and water bodies (for evaluating soil ingestion and uptake into fish tissue in water bodies). Modeling should provide facility analyses consistent with MassDEP and EPA permit requirements. That is, results will include facility impact estimates of all contaminants of concern, both criteria pollutants and specific toxics, identified in Sub-Task 8, at all relevant averaging periods together with existing background concentrations (but without interacting source impacts.) Contaminants will include the recently promulgated 1-hour NO_2 National Ambient Air Quality Standard. In addition, modeling will assess the facilities' impact on deposition of certain contaminants of concern (i.e., arsenic, lead, and mercury) and mobile source emissions associated with facility operations.

Source and Emissions Information

To ensure that modeling captures maximum impacts, the consultant will provide stack and emission data corresponding to worst case operating conditions for these two hypothetical facilities based on data collected in the prior Sub-Tasks (this typically involves evaluating impacts of maximum, minimum, and intermediate production rates). This will include data for all points of emission including stack emissions after controls, fugitive emissions from facility operations and mobile emissions from vehicles associated with facility operations (e.g., fuel delivery vehicles). It will employ a conservative estimate of expected diesel truck use associated with the facility as well as other mobile sources, along possible routes. Truck tailpipe (including diesel for PM 2.5) emission factors will be based on MOBILE6.2 output, which MADEP will provide.

Receptor Network

The consultant will develop an ambient air receptor network of sufficient density and extent to ensure that both short and long term maximum impacts will occur and be identified within the modeling domain. Receptors should, at a minimum, be spaced 50 meters apart within 500 meters of the facility and along the fence line. Spacing should then increase to 100 meters from distances of 500 to 2000 meters and to 200 meters at distances beyond 2000 meters. The network should also include sensitive receptors, such as schools, hospitals, nursing homes, etc.

Meteorological Databases

The consultant will model each of the six hypothetical facilities using five sequential years of representative surface and concurrent upper air meteorological data from National Weather Service stations or other sources of data of equal quality. Consultants should confer with MassDEP staff on data representativeness. The table below lists most upper air/surface meteorological station pairings applicable for Massachusetts facilities.

UPPER AIR STATIONS	CHATHAM, MA	GRAY, ME	ALBANY, NY
SURFACE STATIONS	Hyannis, MA Providence, RI New Bedford, MA Falmouth, MA Martha's Vineyard, MA Nantucket, MA Kingston, RI	Boston, MA Beverly, MA Lawrence, MA Bedford, MA Norwood, MA	Chicopee, MA Westfield, MA Orange, MA Bradley Field, CT

For predicting 1-hour NO_2 impacts, the consultant will minimize the number of hourly calm or variable wind observations. This can be accomplished by creating hourly winds from 1-minute-averaged winds, which NWS stations measure and have available. It has been demonstrated that hourly winds thus created contain far fewer calms and variables than do the reported hourly observations.

The consultant will supply wind roses for each meteorological database.

Surface Characteristics

AERMOD requires representative, seasonally varying atmospheric turbulence parameters: surface roughness, Bowen ratio, and albedo. MADEP will accept AERSURFACE derived values or, with MADEP approval, user defined values.

Topographic Data

The consultant will specify the source and resolution of terrain data used in the modeling.

Dry and wet deposition

In addition to health risks from inhalation, the risk assessment will potentially examine ingestion risks. The consultant will thus develop model estimates of maximum dry and wet deposition of arsenic and lead in soil, and of mercury (in units of $\mu g/cm^3/yr$) in fresh water bodies, as per subtask 8, at or near sensitive receptors associated with each hypothetical facility at each of the three locations within the state.

Background Air Quality

The consultant will ascertain the existing background air quality from the MassDEP monitoring network for all criteria air pollutants. Because Massachusetts, like other states, does not have a

toxic pollutant ambient monitoring network, the consultant will provide facility impact values only for all identified toxic contaminants.

Comparisons with Air Standards and Guidelines
The consultant will compare the sum of model-predicted and background concentrations with applicable Federal NAAQS (for PM 2.5, assume 12/30 $\mu g/m^3$ (annual/24 hour)), including the new 1-hour NO_2 standard and model-predicted concentrations with state air guidelines, Allowable Ambient Limits (AALs) and Threshold Effect Limits (TELs).

Ingestion Risks, If Warranted
As noted above, the consultant would evaluate the ingestion pathway for lead, arsenic and mercury. The consultant will compare predicted lead and soil levels with MassDEP's soil standards and fish mercury concentrations with MDPH's fish consumption advisory trigger limits.

Documentation
The consultant will provide MassDEP with electronic copies of all modeling inputs and outputs. The consultant will also prepare written documentation of inputs, outputs, and analyses for distribution to the public and other interested parties.

Based on the findings from the "State of the Science" and Gap Analysis Report (Task I) and on the generic public health impact assessment (Task II), MassDEP will decide whether or not to entertain permit applications from facilities that propose to use C&D wood as fuel for electricity generation. Please note: a decision by MassDEP to entertain permit applications for these facilities does not mean that particular applications will or will not be approved. Each permit application would be evaluated on its individual merits.

Task III: Recommendations for supplementing current requirements for data and analyses for MassDEP permit applications and MEPA filings.

If MassDEP decides to proceed with Task III, the consultant will prepare recommendations for supplemental data and analyses (e.g., modeling) (i.e., in addition to information that is already required) that project proponents would be required to submit with their MEPA filings and applications for MassDEP permits for facilities that would use C&D wood as fuel for electricity generation. The additional data and analyses would be designed to:

1. Identify impacts of specific proposed C&D wood combustion or gasification facilities, and would support an enhanced assessment of the risks that a facility may pose and its potential impacts on public health; and
2. Evaluate existing health issues in the area that would be affected by the proposed facility and potential mitigation options.

At a minimum, the recommendations should include how a project proponent should address the following:

1. A description of the facility's fuel source and amounts of C&D wood burned per day
2. Identification of COCs to be addressed, noting that COCs could vary for different facilities, depending on the type and amounts of C&D wood in different proposals and other factors
3. RISK ASSESSMENT, STEP 1 – INHALATION
    - Describe methods to conduct air dispersion modeling to calculate ambient COC levels at the maximum point of impact.
    - Identify options to show whether the emissions of COCs from the facility meet MA Air Standards and Air Guidelines. Estimate the total cancer and noncancer risks.
    - For COCs that do not have MA air standards and guidelines, identify options for developing equivalent values (e.g., values from EPA, ATSDR, Cal EPA, etc.). Develop a protocol to determine if facility's COC emissions meet these values.
4. RISK ASSESSMENT , STEP 2 – INGESTION
    - Identify public health and/or environmental triggers that warrant an assessment of impacts from the ingestion route of exposure to COC emissions of, at a minimum, lead and arsenic onto soil, and of mercury into water bodies (which is taken up by fish). (Additional COCs may be considered for the ingestion route of exposure.)
    - Identify data and analytical options for estimating the impacts from the ingestion route of exposure due to deposition of COC emissions when the triggers identified in the step above are present. Identify options for air deposition modeling and food chain uptake. This would include selecting chemicals that can bioaccumulate, obtaining uptake data, ingestion factors, toxicity data and describing the steps to estimate cancer and noncancer risks.
    - Identify options for the steps that would be taken to assess combined inhalation and ingestion risks.
5. COMMUNITY HEALTH STATUS AND HEALTH ASSESSMENT CONSIDERATIONS

   MDPH will lead the consultant on this effort.
    - DPH will lead the consultant in developing protocols and guidelines for evaluating health data relative to proposed projects. These protocols and guidelines will be based on MDPH's experience evaluating health data and on the health impact assessment (HIA) that MDPH will be conducting for the proposed Springfield C&D facility in parallel with the work to be performed under this SOW.
    - Identify data needed to determine whether existing health problems in the area that would be affected by the facility will be further exacerbated by facility emissions, including associated facility traffic impacts.
    - Identify procedures for obtaining community health status information from MDPH on diseases that can be affected by the C&D wood burning emissions (e.g., asthma prevalence and hospitalization rates; cardiovascular disease rates, and blood lead poisoning). The recommendations should also address the amount of data, for example, how many years of health statistics information should be used and how it should be illustrated, flagging geographic areas where elevated health problems are occurring (statistically elevated above state rates).

- Describe how to estimate air emissions/impacts from vehicles associated with the proposed facility.
- Describe potential mitigation factors that MDPH would consider (e.g., burn less wood, retrofit facility-associated vehicles, build parks, etc.) and describe how these mitigation factors can be applied.
- Describe how to make a qualitative assessment of what the facility emission impacts could be on diseases of concern.

Task IV: Public Participation

1. The consultant will present the results of Tasks I and II at times and places of MassDEP's choosing and will summarize and draft responses to all significant public comments.
2. If MassDEP decides to proceed with Task III, the consultant will present the results of Task II at times and places of MassDEP's choosing and will summarize and draft responses to all significant public comments.
3. The consultant should anticipate that at least two public meetings will be held after draft reports are available from Tasks I and II, and two more after Task III.

Appendix A.

References:

Emissions from Burning Wood Fuels Derived from Construction and Demolition Debris
NESCAUM, 2006:
http://www.nescaum.org/documents/2006-0710-emiss_from_burning_wood_fuels_derived_from_c-d_report.pdf/

BACT Guidance for Biomass Projects
MassDEP
April 18, 2007
http://www.mass.gov/dep/air/laws/biombact.pdf

2007 Massachusetts Construction and Demolition Debris Industry Study
Final Report, DSM Environmental Services Inc., May 16, 2008
http://www.mass.gov/dep/recycle/reduce/07cdstdy.pdf