GZA
GeoEnvironmental, Inc.

Engineers and Scientists

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Mayor William F. Martin
Town of Greenfield
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Re: Independent Review of Air Quality and Sound Level Impact Analyses Performed in Support of the Proposed Pioneer Renewable Energy Facility Greenfield, Massachusetts

Dear Mayor Martin:

GZA GeoEnvironmental, Inc. (GZA) has completed an independent review of the Major Comprehensive Air Plan Approval Application and the Sound Level Impact Analysis prepared by Epsilon Associates in support of the proposed Pioneer Renewable Energy (PRE) Facility to be located in Greenfield, Massachusetts. A summary of our findings is provided in the following sections.

Air Plan Approval Application

An Air Plan Approval Application was prepared by Epsilon Associates to demonstrate that the proposed facility would comply with all applicable Massachusetts Department of Environmental Protection (MassDEP) and United States Environmental Protection Agency (EPA) regulations and standards. Approval of the application by the MassDEP will play a major role in allowing the proposed project to proceed with construction and eventual operation.

Air Pollution Control Technology Evaluation

An applicant must perform a "top-down" Best Available Control Technology/Lowest Achievable Emission Rate (BACT/LAER) analysis to determine the appropriate air pollution control technology equipment for a proposed project. The "top-down" process requires that all available control technologies be ranked in descending order of control effectiveness. The most stringent alternative must be selected unless the applicant demonstrates that the most stringent technology is not achievable based on technical considerations and/or energy, environmental or economic impacts.

Epsilon Associates (Epsilon) performed an adequate pollutant-specific BACT/LAER analysis by examining the RACT/BACT/LAER Clearinghouse and recent permits issued by the MassDEP. For each pollutant, Epsilon selected the most stringent technology or provided a valid basis for the selection of another air pollution control strategy. The air pollution control train will include an electrostatic precipitator, a multi pollutant catalytic

reactor and an oxidation catalyst. PRE's requirement to only accept "clean" wood fuel will help further minimize emissions of hazardous air pollutants (HAPs). As evidenced by the insignificant impacts predicted for the boiler, the air pollution control technology proposed for this facility will ensure that emissions from the boiler will be protective of public health and welfare.

Regulatory Review – Federal and State

Epsilon Associates performed a detailed regulatory review of Federal and state regulations to ascertain the applicability of these regulations to the proposed PRE facility. Although numerous air quality programs are addressed in the application, the most important program for this project from an air quality perspective is attainment and non-attainment new source review. By comprehensively addressing new source review regulations, which the application achieves, the applicant has evaluated all of the critical issues that have an impact on public health and welfare.

Air Quality Impact Analysis

An applicant for a new source review permit is required to conduct an air quality impact analysis of the ambient impacts associated with the construction of a proposed new source. The main purpose of the air quality impact analysis is to demonstrate that new emissions from the proposed source, in conjunction with other applicable emissions from existing sources, will not cause or contribute to a violation of any applicable national ambient air quality standards (NAAQS). Ambient impacts of HAPs must also be evaluated.

Epsilon made use of three dispersion models to evaluate air quality impacts from the proposed PRE facility. The models utilized were: AERMOD to evaluate the dispersion of criteria pollutants and HAPs; SACTI to evaluate the potential impacts of fogging and icing caused by the mechanical draft cooling towers and; ALOHA to evaluate the potential accidental release of ammonia. The use of these models is appropriate for the stated purposes.

Prior to embarking on a discussion of the results from these models, it is important to understand the standards to which the predicted impacts are compared, especially for the criteria pollutants (sulfur dioxide, nitrogen dioxide, carbon monoxide and particulate matter). The Clean Air Act requires EPA to set NAAQS for pollutants considered harmful to public health and the environment. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The EPA Office of Air Quality Planning and Standards (OAQPS) has set NAAQS for six principal pollutants, which are called "criteria" pollutants. They are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), lead (Pb) and two types of particulate matter: particulate (PM_{10}) and fine particulate ($PM_{2.5}$). Furthermore, EPA has set significant impact levels for all of the criteria pollutants except O_3 and $PM_{2.5}$ (the MassDEP has set a

temporary significant impact level for $PM_{2.5}$). The significant impact levels have been set at very small fractions of the NAAQS, ranging from one to five percent of the associated NAAQS. If a new source of emissions has an impact less than a significant impact level, then it has been demonstrated that the source cannot cause an exceedance of a NAAQS, regardless of the level of impacts associated with existing nearby sources and/or the level of current background concentrations.

Emission Rates

For a NAAQS compliance demonstration, the emission rate for the proposed new source must reflect the maximum allowable operating conditions as expressed by a federally enforceable emission limit, operating level and operating factor for each applicable pollutant and averaging time. An applicant should base the emission rates on the results of a BACT analysis. Epsilon used maximum hourly and average annual hourly emission rates in its air quality impact analysis that conform to this requirement.

Receptor Grid

Polar and Cartesian networks are two types of receptor networks commonly used in refined air dispersion models. A polar network is comprised of concentric rings and radial arms extending outward from the applicant's source. Receptors are located where the concentric rings and radial arms intersect. A Cartesian network consists of north-south and east-west oriented lines forming a rectangular grid with receptors located at each intersection point. Epsilon has used a polar grid network in its analysis. To ensure that maximum concentrations were modeled, Epsilon superimposed a fine mesh Cartesian grid at the polar coordinate receptors where highest impacts were predicted. This is the appropriate procedure to follow in a NSR air quality impact analysis.

GEP Stack Height Analysis

Section 123 of the Clean air Act defines a good engineering practice (GEP) stack height as "the height necessary to insure that emissions from the stack do not result in excessive concentrations of any air pollutant in the immediate vicinity of the source as a result of atmospheric downwash, eddies or wakes which may be created by the source itself, nearby structures or nearby terrain obstacles." Epsilon has used the GEP stack height formula to calculate a GEP stack height for the proposed PRE facility. Based on the formula, the GEP stack height for the PRE facility is 300 feet. The proposed boiler stack, emergency generator stack and cooling tower are all below the GEP stack height.

There is no regulatory requirement to build a stack that has a height equivalent to a GEP stack height. There are legitimate reasons for not constructing a stack to its GEP stack height. For example, it is cheaper to construct a shorter stack height as opposed to a taller stack. Furthermore, a shorter stack will have less of a visual impact than a taller stack.

For a stack height less than GEP stack height, the applicant must assess the potential air quality impacts associated with building downwash. In some cases, the aerodynamic

turbulence induced by surrounding buildings will cause stack emissions to be mixed rapidly toward the ground, resulting in higher-than-normal ground level concentrations in the vicinity of the source. The EPA-approved AERMOD model used by Epsilon has the capability to evaluate building downwash effects on maximum estimated pollutant concentrations. Based upon Epsilon's analysis, emissions from the boiler stack, emergency generator stack and the cooling tower resulted in impacts that were below significant impact levels despite the fact that these emission release points were all below the calculated GEP stack height.

Meteorological Data

The meteorological data used in the AERMOD model consisted of five years (1991-1995) of surface data from Westover Air Force Base in Chicopee, MA. This station is located approximately 29 miles to the south of the PRE site. The processed meteorological files used in the analysis were obtained from the MassDEP and were apparently used with MassDEP approval. There are several issues associated with the use of this data.

1. The Westover station is a significant distance from the site. If available, meteorological data from a location closer to the site would be preferable.

2. The PRE site is located approximately 3,000 feet from the Connecticut River and is in the Connecticut River Valley. The Westover station is located approximately three miles from the Connecticut River and probably does not experience the same valley wind flow patterns that occur in the vicinity of the PRE site.

3. It is likely that the meteorological instrumentation at the Westover station is not nearly as sensitive and accurate as the meteorological data collected at stations equipped with more modern instrumentation. Specifically, the minimum wind speed threshold at Westover is probably high enough so that many hours of low wind speed conditions are missed and instead are recorded as calm conditions. This is borne out by the extraordinary high frequency (20.43%) of calm conditions recorded at Westover for the years 1991-1995. The AERMOD model ignores calm conditions. This means that nearly 9,000 hours of data during the five-year meteorological record were not evaluated for impacts. If meteorological data could have been obtained from a station equipped with instrumentation having a higher degree of sensitivity and accuracy, it is likely that thousands of hours of low wind speed conditions which had not been evaluated initially, would now be included in the analysis.

To summarize the above, had Epsilon been able to obtain meteorological data from a station located in the Connecticut River Valley and if that station were equipped with more sensitive and accurate instrumentation than what was used at Westover during the period of record, many more hours of low wind speed conditions would have been evaluated.

A higher frequency of occurrence of low wind speeds would likely have a significant effect only on ground-level fugitive emissions. It is important to note that elevated emissions from the boiler stack would not be adversely affected by a higher frequency of occurrence

of low wind speeds. As it turns out, the fugitive emission source category is also the only source category which had predicted impacts above the significant impact levels. Hypothetically, if we assumed that use of more sensitive and accurate meteorological data resulted in an increase of fugitive emission impacts by 50%, how would this affect PRE's ability to demonstrate compliance with NAAQS?

For PM_{10}, the total modeled 24-hour average concentration would increase by 23.3 $\mu g/m^3$, resulting in a cumulative impact of 100.9 $\mu g/m^3$, which is still considerably below the NAAQS of 150 $\mu g/m^3$. On an annual basis, the total modeled concentration would increase by 4.3 $\mu g/m^3$, resulting in a cumulative impact of 23.8 $\mu g/m^3$, which is also well below the NAAQS of 50 $\mu g/m^3$. With respect to $PM_{2.5}$, a 50% increase in fugitive emission impacts would cause the total modeled 24-hour average concentration to increase by 1.9 $\mu g/m^3$, resulting in a cumulative impact of 33.7 $\mu g/m^3$, which is still below the NAAQS of 35 $\mu g/m^3$. Finally, for the $PM_{2.5}$ annual averaging period, the total modeled concentration would increase by 0.5 $\mu g/m^3$, causing the cumulative impact to increase to 10.8 $\mu g/m^3$, which is still substantially below the NAAQS of 15 $\mu g/m^3$. The impacts discussed here are basically fenceline impacts. Predicted impacts of fugitive emissions are likely to decrease dramatically as one moves away from the site boundary.

It is important to note that PRE has committed to take positive actions to reduce the impacts of particulate matter fugitive emissions. The current land use at the site is a quarrying operation which has inherently high levels of particulate matter fugitive emissions, especially from unpaved roads. Activities at a wood-fired boiler typically have much lower particulate matter fugitive emissions. Furthermore, PRE has agreed to pave the on-site roads, resulting in much lower emissions from on-site traffic. Still another option available to PRE is to increase the amount of road wetting to further control particulate matter fugitive emissions. According to Epsilon emission calculations, a 75% control efficiency was assumed for unpaved roads. A ten percentage point increase in control efficiency would nearly cut the particulate matter fugitive emission impact in half.

Background Data

In order to determine compliance with a NAAQS when a source is predicted to have a significant impact, other nearby sources have to be included in the analysis along with a background concentration that accounts for ambient air concentrations resulting from other minor sources as well as mobile source emissions. Epsilon contacted the MassDEP, the New Hampshire Department of Environmental Services and the Vermont Department of Environmental Conservation to obtain inventories of sources that needed to be included in the modeling analysis. Each agency replied that there were no sources that met the criteria for inclusion in the modeling analysis.

In addition, ambient background concentrations were analyzed and included in the analysis. Based upon the locations of the air quality monitoring stations, it is likely that the background concentrations selected by Epsilon are reasonable (if not overestimates of) representations of background air quality at the PRE site.

Hazardous Air Pollutant Evaluation

Epsilon evaluated an extensive list of HAPs and other non-criteria pollutants against the annual Allowable Ambient Limits and the 24-hour Threshold Effects Exposure Limits established as guideline values by the MassDEP. These limits are protective of public health from the toxicity of the non-criteria pollutants. The predicted impact of each non-criteria pollutant was well below the applicable limit.

Cooling Tower Analysis

Epsilon utilized the SACTI model developed by the Electric Power Research Institute (EPRI) to assess the impacts of fogging and icing on the community resulting from water vapor emitted from the wet mechanical draft cooling tower located on the PRE site. The SACTI model is an appropriate model to use for this purpose. According to the modeling results reported by Epsilon, the frequency of occurrence of fogging or icing are minimal and such occurrences likely coincide with cold and damp inclement weather. This conclusion is consistent with other cooling tower facilities in the northeastern United States.

In summary, the air quality impact analysis performed by Epsilon demonstrates that the facility will have impacts that are well below NAAQS. In fact, with the exception of fugitive emissions, the impacts of emissions from the boiler, emergency generator and cooling tower, in the aggregate, are below significant impact levels. Since significant impact levels are small fractions of the NAAQS, and the NAAQS have been set at levels that are protective of public health (including the health of sensitive populations), it is readily apparent that the facility will not adversely impact the local community.

Sound Level Impact Analysis

A Sound Level Impact Analysis was conducted by Epsilon to evaluate the potential noise generated by the proposed PRE facility. The analysis consisted of a noise monitoring program and a noise site assessment. The noise monitoring program was conducted to document existing ambient background levels in the area surrounding the proposed site and to establish a background level to develop a criteria limit required to evaluate potential noise generated by the proposed project. The noise site assessment analyzed all potential noise sources resulting from the operation of the future power plant facility and compared the estimated noise levels to applicable noise regulations.

The Sound Level Impact Analysis compared the potential noise generated by the proposed facility to applicable State of Massachusetts and Town of Greenfield noise regulations. The State regulations limit the proposed facility to 10 decibels (dBA) above the existing ambient background level (defined as L_{90}, which is the noise level exceeded 90 percent of the time) established during the noise monitoring program. In addition, the State regulations prohibit "pure tone" conditions, which is when any octave band center frequency sound level exceeds the adjacent center frequencies by 3 decibels or more. The Town's noise regulations do not contain any criteria limits but do require that sound not be observable without instruments at different distances depending on the receiver's land use

(industrial, commercial or residential). Both the State of Massachusetts and Town of Greenfield noise regulations were appropriately evaluated and applied in this analysis.

A noise monitoring program was conducted to document the existing ambient background noise levels surrounding the proposed facility. Six (6) monitoring locations were selected to capture noise levels at different times of the day as well as during weekday and weekend periods. Two locations were monitored on a continuous basis for approximately six (6) days including weekday and weekend periods. Short-term (20-minute) noise measurements were conducted at the other locations during daytime and nighttime weekday and weekend periods. Nighttime periods were selected to reflect the quietest times of the day based on observed activity in this area. Although continuous measurements at these locations might have been preferable to short-term measurements in capturing all possible variations of noise surrounding the facility, the short-term measurements periods selected were sufficient based on known activity surrounding the proposed site. Proper monitoring procedures were also followed including the use of Type I sound level meters, appropriate meter set-up and calibration before and after each measurement.

After the noise monitoring program was completed, the lowest ambient background level (L_{90}) was selected at each of the six (6) monitoring locations for daytime and nighttime periods. For the two locations where continuous measurements were conducted, measured hourly noise data that was determined to involve inclement weather conditions (high winds, measureable precipitation and low temperatures) were appropriately removed from the data sets before an ambient background level was selected. For example, monitoring standards recommend avoiding conducting noise measurements in certain weather conditions such as high winds over 11 mph. These ambient background levels were then appropriately assigned to several modeling locations based on similar noise sources in those areas.

Table 4-3 of the Sound Level Impact Analysis Report presents the baseline sound levels that were selected for this project. The daytime baseline sound level for Location 5 (Scout Road) was incorrectly entered as 39 dBA when it should be 37 dBA according to information contained in Tables 4-1A and 4-1B. This issue will be addressed further during the discussion of modeling results provided below.

The Report includes a section that describes the sound sources and reference sound data used in the noise site assessment. All selected sources as well as attenuation factors included in the assessment appear to be appropriate and reasonable for this type of power plant facility. However, the report notes that on-site haul truck activity was not included in the analysis due to lower noise levels when compared to front-end loader activity. This statement is likely true but the haul trucks should have been included in the analysis for completeness. At a minimum, noise reference levels could be provided to demonstrate that haul truck noise levels are so low that they will not contribute to the overall facility-wide noise level. In addition, noise levels estimated for the operation of the Roundwood Chipper includes the use of a 35-foot high woodchip pile to mitigate the noise levels generated by this operation. Although this woodchip pile does provide significant

attenuation of noise from this source, this implies that the woodchip pile will consistently be at a 35-foot height at all times. If the woodchip pile will vary in height, the lowest potential height should only be used to calculate noise levels as a conservative estimate.

As part of the MEPA Environmental Notification Form submittal, a Traffic Evaluation was prepared to analyze the impact of truck deliveries on the surrounding community (the Traffic Evaluation can be found in Appendix G of the MEPA submittal). The conclusion of the Traffic Evaluation was that site-generated trips will not materially impact traffic on roadways in the area serving the proposed facility. The Traffic Evaluation determined the impact of increased truck activity to be minimal based on what is currently in the area. This would most likely translate into minimal noise impacts for the residences located along Adams Road. Also, to further reduce any potential noise impacts, truck deliveries will only occur during daytime hours (between the hours of 7 a.m. and 10 p.m.) as stipulated in the facility's Town of Greenfield Special Permit. Nighttime deliveries should be avoided, if possible, when people tend to have a higher sensitivity to noise.

As discussed previously, the daytime baseline sound level for Location 5 (Scout Road) was incorrectly entered into Table 4-3. This results in changes to Tables 6-3, 6-5 and 6-6. The effect of this change on the "Increase Over Existing Daytime" level is limited to Table 6-6 where the increase changes from 3 dBA to 4 dBA. The 4 dBA increase is still below the 10 decibel above ambient background State criteria limit.

Finally, the discussion of the Town of Greenfield noise regulations as it relates to the proposed facility appears to be appropriate and reasonable.

In summary, the sound level impact analysis performed by Epsilon demonstrates that the facility will comply with all applicable Commonwealth of Massachusetts and Town of Greenfield noise regulations.

This concludes our independent review of the Air Quality and Noise Impact Analyses associated with the proposed Pioneer Renewable Energy Facility to be located in Greenfield, Massachusetts. A brief description of GZA's capabilities and experience relative to waste-to-energy and, more specifically, waste-wood-to-energy, as well as the resumes of the authors of this report, Mitchell Wurmbrand and Mark Bolduc, are attached. Please contact us if you have any questions.

Very truly yours,

GZA GEOENVIRONMENTAL, INC.

Mitchell M. Wurmbrand, CCM
Associate Principal

Mark L. Bolduc
Assistant Project Manager

Attachments

Mitchell M. Wurmbrand, CCM
Associate Principal

RESUME

Summary of Experience

Mr. Wurmbrand has managed environmental permitting assignments and air quality assessments for energy projects throughout the country. Many of these projects were renewable energy projects involving wind energy, biomass-to-energy and biodiesel. He has managed numerous siting studies for electric generating facilities and has performed due diligence studies associated with the potential acquisition of energy generating assets. As a Certified Consulting Meteorologist, Mr. Wurmbrand has certified and used meteorological data to determine wind energy resources and in nuclear energy applications to estimate the effects of routine and accidental radioactive releases. Mr. Wurmbrand was asked to serve as an expert witness to support applications for air permits for several energy projects. He has authored technical papers concerning the energy industry addressing issues relating to air quality impacts, air pollution control technology, stack height regulations and emission offsets. A significant portion of Mr. Wurmbrand's project experience has pertained to permitting merchant power projects and conducting air quality evaluations for large and complex industrial and institutional facilities. Mr. Wurmbrand is responsible for providing technical and regulatory expertise in the design and management of environmental licensing activities. He plays a key role in developing licensing strategies and negotiating with regulatory agency staff on behalf of the client. Other project responsibilities include familiarity with emission reduction credit trading, air quality impact analyses, experience with air quality and meteorological monitoring, and knowledge of air quality codes, standards, and regulations for criteria and non-criteria pollutants. Generally, Mr. Wurmbrand's project experience has dealt with conducting numerous modeling studies in support of PSD applications, fuel variances, waiver requests, and SIP revisions. He is also involved with projects that must deal with solid waste management, industrial wastewater discharges, site investigations and environmental surveys. Mr. Wurmbrand participates on the Connecticut State Implementation Plan Revision Advisory Committee (SIPRAC), a committee that offers peer review regarding air quality policies proposed by the Connecticut Department of Environmental Protection (CTDEP). He was selected to sit on the Steering Committee of Connecticut Business & Industry Association's Environmental Policies Council.

Education

B.S., 1970, Meteorology, The City College of New York
M.S., 1973, Meteorology, New York University

Professional Registrations/Affiliations

Certified Consulting Meteorologist, American Meteorological Society
Air & Waste Management Association
American Meteorological Society
Conn. Power & Energy Society
Conn. Business & Industry Association, Environmental Policies Council
Conn. State Implementation Plan Revision Advisory Committee

Areas of Specialization

Energy Facility Permitting
Air Permitting Strategies
Air Quality Impact Analysis
Environmental Compliance
Waste-to-Energy Projects
Expert Testimony
Meteorological Studes

Relevant Project Experience

Principle-in-Charge and Project Manager – Wind Energy Siting and Permitting Study – Confidential Massachusetts Client. For an institutional client in Massachusetts, Mr. Wurmbrand led a study to determine whether a specific site had sufficient wind energy resources to install and operate a wind turbine. Representative meteorological data were obtained from a nearby air force base and analyzed against standard Wind Power Class ratings. Additional work entailed the identification of the various federal, state and local environmental and land use permits and approvals that were required prior to turbine installation.

Principal-in-Charge – Environmental Permitting and Compliance Services – Verizon Wireless. For nearly 15 years, Mr. Wurmbrand has been Principal-in-Charge and provided senior technical support on projects involving the installation of emergency backup power

generators at Verizon Wireless cell sites, mobile switching centers, and data centers operated by Verizon Wireless throughout their service area. On each project, Mr. Wurmbrand was responsible for preparing air permit applications and providing environmental consulting support to assist Verizon Wireless to obtain air permits and to meet other environmental compliance requirements of federal, state, and local regulatory agencies. With Mr. Wurmbrand's assistance, Verizon Wireless was able to secure permits for well over 100 emergency generators in Connecticut, New York, New Hampshire, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, Ohio, Indiana, Kentucky, North Carolina, Texas, Arizona and Nevada.

Principal-in-Charge, University of Connecticut, On-Call Engineering Services. Mr. Wurmbrand has served as the Principal in Charge for all tasks authorized by a series of University of Connecticut on-call contracts for more than ten years. He oversaw all activities relating to the environmental permitting of the the UConn Energy Center, a recently constructed and operational cogeneration facility on the Storrs campus. Additionally, he also oversees other tasks including the preparation of air emission inventories at most UConn campuses, Title V air permit applications, preparation of new source review permit applications, air quality impact analyses for selected sites, and preparation of air compliance matrices for all UConn campuses.

Principal-in-Charge, Connecticut Resources Recovery Authority. Mr. Wurmbrand has functioned as the Principal-in-Charge for CRRA assignments since the mid-1980's. These assignments include projects performed at The Mid-Connecticut Project, the Southeastern Connecticut Resource Recovery Facility, the Bridgeport Resource Recovery Facility, the Wallingford Resource Recovery Facility, the Hartford Landfill, the Wallingford Landfill and the Shelton Landfill. Mr. Wurmbrand supervised a multi-year study of air emissions from the Hartford Landfill. Specific tasks included monitoring of air emissions from the surface of the landfill, emissions testing of the flare at the landfill, performing a health risk assessment of air emissions from the landfill, conducting an air quality impact analysis of fugitive dust emissions from the landfill, and performing an odor assessment of air emissions from the landfill. He also served as an expert witness in a court case involving property owners in the vicinity of the Hartford Landfill against CRRA and the Metropolitan District Commission (MDC). Mr. Wurmbrand's testimony demonstrated that emissions from the landfill would not result in odors adversely impacting the neighbor's properties.

Principal-in-Charge, New 520 MW Natural Gas Electric Generating Facility, Air Permits To Construct And Operate. Mr. Wurmbrand was the Principal-in-Charge of the team that prepared air permit applications to the Department of Environmental Protection (DEP) to construct and operate a new natural gas-fired 520 MW electric generating facility adjacent to an established utility. The most unique feature of this project was the schedule. Within a twelve-month period, the owner intended to obtain all environmental approvals, complete construction, and have Phase I of the new plant operational. In order to accomplish this objective, the team was allotted four weeks to prepare and submit a complete permit application package to the DEP. Not only did the team meet this tight schedule but it improved upon it by completing the permit application package within three weeks.

Construction was initiated based on the accelerated tentative determination and the plant was operational and supplying electricity to the grid within thirteen months of the beginning of permit preparation.

Principal-in-Charge and Project Manager - Mid-West Site Selection Study. Mr. Wurmbrand headed the team that was retained by a merchant power plant developer to evaluate three regions in two mid-western states for the selection of suitable sites for merchant power plant development. The developer was searching for sites that could be used for either a peaking facility and/or a base-load facility. The team identified specific criteria to use to evaluate potential sites within each region. Some of the criteria used in the study included proximity to electric transmission and gas supply lines, availability of water and sewer, surrounding land use and presence of adverse "political" issues. The latest digital and GIS technology was used to gather data on potential sites. In addition, the core team visited each potential site to gain an "up close and personal" appreciation of the characteristics of each site. Numerous officials at the state, county and local level were interviewed to obtain a better understanding of the regulatory requirements associated with project development and to get a better sense of the political climate within each region.

Principal-in-Charge and Project Manager. Proposed Merchant Power Development, Environmental Permitting Issues Analysis. Mr. Wurmbrand headed the effort to prepare an analysis of the host of environmental permitting issues that would potentially face the project planned for development on an existing site in Connecticut. Analysis and evaluation of advantages and disadvantages of several critical environmental issues were performed including: existing power generating site, the range of issues to be addressed with the Connecticut Siting Council from aesthetics to endangered species to noise impacts, water supply and discharge, land use and public perception, potential citizen intervention, air emissions, air and water permitting issues, possible permit application timetables, backup fuel usage issues, gas pipeline issues, and the status of other proposed power plant developments in the state. Armed with this extensive information, a merchant power plant developer was enabled to make an informed decision about the feasibility of initiating a project of this kind.

Principal-in-Charge, Environmental Permitting Services for a New Energy Center, Central Connecticut State University, New Britain, Connecticut. Mr. Wurmbrand oversaw the team that was retained by vanZelm, Heywood & Shadford, an established Connecticut-based Architectural and Engineering firm, to provide comprehensive environmental permitting services for Central Connecticut State University's (CCSU) new Energy Center. This project, which included the installation of three gas-/oil-fired boilers and two natural gas-fired reciprocating engine generators, presented a significant air permitting challenge because of the need to avoid triggering the burdensome requirements of nonattainment New Source Review. CCSU and other project team members worked together to develop and implement a successful air permitting strategy. An air permit application, including a SCREEN3 dispersion modeling analysis, and a water discharge permit application were prepared and submitted to the CTDEP. Air permits and wastewater discharge permits for the facility were subsequently approved and the Energy Center is now in operation.

Principal-in-Charge and Project Manager. Environmental Siting and Permitting, Lisbon Resource Recovery Facility, Lisbon, Connecticut. Mr. Wurmbrand was Principal-in-Charge and Project Manager of the team retained to conduct studies to assist a power developer in siting a trash-to-energy plant in Connecticut. Mr. Wurmbrand oversaw the team that was retained to prepare permit applications, presented expert testimony at public hearings and eventually obtained all environmental approvals required for the construction and operation of the Lisbon Resource Recovery Facility. Work included an extensive wetlands evaluation and soil and erosion control during construction. Water withdrawal and discharge to the Shetucket River were also evaluated. Mr. Wurmbrand was a key participant in numerous sessions of public hearings that lasted more than a year.

Mark L. Bolduc
Assistant Project Manager

RESUME

Education

B.S., 1997, Bio-Resource Engineering, University of Maine
B.S., 1993, Mechanical Engineering, University of Maine

Hazardous Waste RCRA Training
DOT/IATA Training
AERMOD Dispersion Modeling Training

Professional Affiliations

Institute of Noise Control Engineering (INCE)

Air & Waste Management Association (AWMA)

Areas of Specialization

Noise Studies
Air Compliance Management
Air Compliance Audits
Air Quality Permitting
Air Dispersion Modeling
Emissions Inventories
Multi-Media Compliance Reviews
SPCC Compliance
Stormwater Compliance
EPCRA Reporting
RCRA Compliance

Summary of Experience

Mr. Bolduc is an Assistant Project Manager who provides air quality and other environmental consulting services to a diverse group of industrial, commercial and utility clients as well as educational and healthcare institutions. Responsibilities include performance of air compliance audits, which entail the preparation of emissions inventories and the performance of regulatory analyses for the determination of applicability, preparation of air permit applications including Title V operating permits, General Permits, New Source Review (NSR) Permits to Construct/Operate (including PSD), performance of BACT analyses, preparation of NOx Compliance Plans, collaborating with clients in the development of recordkeeping and reporting practices required in order to maintain compliance with permits and orders, preparation of Pre-Inspection Questionnaires (PIQ's) to assist clients prior to facility inspections, conducting air quality dispersion modeling to document the effects of commercial and industrial activities on the local community, conducting multi-media regulatory compliance reviews, preparation of TRI and Tier II reporting forms based on EPCRA requirements, preparation of Spill Prevention Control and Countermeasure (SPCC) Plans, preparation of Stormwater Pollution Prevention Plans (SWPPP's) and stormwater registrations, preparation of hazardous waste Contingency Plans and conducting inspections for stormwater and hazardous waste compliance issues. In addition to these responsibilities, Mr. Bolduc has also been involved with noise study projects for potential commercial and residential developments. Noise studies included extensive noise monitoring programs to document existing ambient background noise levels and calculating potential noise contributions from commercial and industrial activities using a noise prediction model. Measured and predicted noise levels are compared to federal, state and local noise regulations to determine whether potential commercial and residential developments are at acceptable noise levels and meet all applicable regulatory requirements. In addition, Mr. Bolduc has been involved with construction projects providing assistance in noise monitoring and preparation of noise mitigation plans.

Relevant Project Experience

Project Manager – Fairfield Residential, Plainville, CT, Noise and Air Quality Evaluation for a Proposed Residential Development.
A noise evaluation was conducted for a proposed residential development located in Plainville, Connecticut. The noise evaluation consisted of a noise monitoring program and site noise prediction modeling. The noise monitoring program was conducted to document the existing ambient background noise levels surrounding a potential residential development. The noise prediction model was created to estimate potential commercial activity noise levels at the residential site. Commercial activities included rock quarry rock removal (drilling, blasting and crushing), asphalt plant operations, concrete plant operations and a police training firing range. Other noise sources surrounding the property included mobile sources traveling along Interstate 84. Noise calculations for the rock quarry activities were based on typical equipment used in construction activities along with corresponding noise reference levels and equipment usage levels. Noise

calculations for the firing range were based on assumed activity levels and measured reference levels from a similar firing range. In addition, particulate matter dispersion screening modeling (using Screen 3) was performed to document the potential effects of activities from the rock quarry on the residential development. Results of the noise monitoring program, noise prediction calculations and particulate matter dispersion modeling were compared to Federal, State of Connecticut and local regulations to determine whether the residential site is acceptable for residential use. Results of these analyses were documented in a technical report.

Project Manager – Fairfield Residential, Old Saybrook, CT, Noise Evaluation for a Proposed Residential Development. A noise evaluation was conducted for a proposed residential development located in Old Saybrook, Connecticut. The noise evaluation consisted of a noise monitoring program and noise site assessment. An extensive noise monitoring program was conducted to document existing ambient background noise levels surrounding a potential residential development. The monitoring program also included recording sound levels of near-by train activity such as train pass-bys and horn usage. Based on the noise monitoring program, a noise site assessment was performed to determine estimated noise levels at several different proposed building locations and areas of outdoor use within the development. Representative noise reference levels were selected based on the noise measurements and then propagated to each location based on distance. Any attenuation features, such as other buildings were also included in the noise analysis. Results of the noise monitoring program and noise prediction calculations at the different development locations were compared to Federal, State of Connecticut and local regulations to determine whether the residential site is acceptable for residential use. Mitigation measures, such as noise barriers and sound proofing, were recommended to reduce estimated noise levels below Federal, State of Connecticut and local noise criteria levels. Results of this analysis were documented in a technical report.

Project Manager – Summit Development & SBLM Architects, Fairfield, CT, Noise Analysis for Commercial Development. The noise analysis consisted of a noise monitoring program and a noise site assessment. The noise monitoring program captured existing ambient noise levels in the area surrounding a future commercial development. The noise site assessment was conducted to evaluate potential noise levels generated from activities located at a proposed retail site along the property lines of several residences directly adjacent to the future development. In order to evaluate noise generated by the potential development site, estimated noise levels were compared to relevant State of Connecticut and local regulations. This comparison, at a minimum, demonstrated potential onset of an impact condition and documented possible areas of concern for the development project moving forward. Noise sources addressed in this noise analysis included roof-top mechanical equipment, loading dock activity, parking lot traffic and parking lot sweeping. A prediction noise model was developed to determine the noise generated by the roof-top mechanical equipment, loading dock activity and parking lot activity. Noise reference levels used for all potential noise sources were consistent with typical mechanical equipment, vehicle traffic and truck activity and with activities conducted at a commercial retail site. Noise predictions accounted for source and receptor elevations, attenuation due to distance, atmospheric conditions, vegetation and proposed barriers. Results of this analysis were documented in a technical report. Participation in Planning & Zoning public hearings was also provided for this project.

Assistant Project Manager – GenPower Development, LLC, Barre, MA, Noise Monitoring Program for Proposed Power Plant. A noise monitoring program was conducted as part of a proposed bio-mass power plant in Barre, Massachusetts. Noise measurements were performed in accordance with Massachusetts Department of Environmental Protection (MassDEP) guidelines. The extensive noise monitoring program was conducted at three locations for one week to document typical existing ambient background noise levels surrounding the proposed power plant development site. The results of the noise measurements were used during the noise analysis phase of the project to determine the onset of any noise impact conditions due to the operation of the proposed bio-mass power plant.

QUALIFICATIONS AND EXPERIENCE
WASTE-TO-ENERGY AND BIOMASS COMBUSTION

SELECTED PROJECT SUMMARIES

QUALIFICATIONS AND EXPERIENCE IN WASTE-TO-ENERGY AND BIOMASS COMBUSTION

GZA has provided a wide range of engineering and consulting services to owners and developers of solid waste management facilities, including landfills, transfer stations and waste-to-energy plants. GZA is a recognized expert in the evaluation and permitting of waste-to-energy facilities, and has provided such assistance to clients in support of over 25 facilities in 12 states. On such projects, our services have ranged from project feasibility analysis to design assistance to permitting preparation and negotiation to start-up air quality testing. GZA continues to play a major role in the permitting of waste-to-energy facilities, having recently prepared Title V Operating Permit Applications for such facilities in Connecticut and Maine.

GZA has provided assistance in reviewing the suitability of prospective landfill sites, in monitoring and evaluating groundwater and surface water quality at existing landfill sites, and providing assistance with air quality and odor issues involving active and closed landfill cells. GZA has performed various tasks associated with the installation of a slurry wall at the Hartford Landfill and has previously evaluated air emissions from the Hartford Landfill surface and the gas recovery flare.

GZA has substantial experience in reviewing and interpreting regulations which directly affect solid waste management facilities. We have attended public hearings on behalf of such facilities, and have provided extensive expert testimony concerning such issues as air quality impacts resulting from emissions from landfills, flares and municipal waste combustors, air pollution control technology, odor assessments, health risk assessments, transportation of municipal solid waste, and impacts on groundwater from activities associated with landfills and municipal waste combustors.

PROJECT DESCRIPTIONS

Wheelabrator Technology Company
Connecticut

GZA conducted studies to assist a power developer in siting a trash-to-energy plant in central Connecticut. GZA was retained to prepare permit applications, present expert testimony at public hearings and eventually obtain all environmental approvals required for the construction and operation of Lisbon Resource Recovery Facility. Work included an extensive wetlands evaluation and soil and erosion control during construction. Water withdrawal and discharge to Shetucket River were also evaluated. GZA was a key participant in numerous sessions of public hearings which lasted more than a year.

Center for Resource Solutions

GZA was retained by the Center for Resource Solutions (a sustainable energy NGO) to evaluate pollutant emissions from *biomass-burning generation power facilities* in New England. GZA evaluated almost one hundred facilities burning wood, wood waste, refuse, and landfill gas based upon their environmental status and greenhouse gas potential. The evaluation was used to certify green energy sources for public sales.

Confidential Client – Due Diligence

GZA, as part of a corporate acquisition due diligence effort, evaluated the operational and environmental aspects of three *bagasse burning cogeneration plants*. The plants were approximately 50 MW each and located in the Florida Everglades. The facilities were used to provide steam and electricity for the company's sugar mills.

Kenetech Energy Systems, Chateaugay, New York

GZA was retained by Kenetech Energy Systems to obtain environmental approvals for a proposed 18 MW *waste wood cogeneration plant* in Chateaugay, New York. Aside from the environmental permitting associated with this type of project, GZA was involved in studies dealing with waste wood characterization, wastewater discharges, noise, and cooling tower impacts. This work involved many multi-media site specific environmental studies. The work included detailed engineering calculations, environmental impact analyses, specialized air, storm water, wastewater, solid waste, noise, traffic, esthetics, historic, archaeological, site investigation, studies, etc. At a later date, GZA prepared the required Title V permit application for the plant.

Kenetech Energy Systems, Fitchburg, Massachusetts

GZA obtained all of the necessary environmental permits and approvals for construction and operation of a 16 megawatt *wood-fired power plant* in Westminster, MA, including preparation of an Environmental Notification Form and Draft and Final Environmental

Impact Reports (EIR). GZA also prepared air, wastewater discharge, and solid waste permits in accordance with the state regulations. The air permitting work involved characterization and quantification of criteria and non-criteria emissions, air quality dispersion modeling, deposition modeling, air toxics analyses for a number of different fuel scenarios, and noise impact analysis. GZA completed the required EIRs and state permit applications and obtained all approvals necessary to construct the plant in less than one year. The speed in obtaining these approvals attests to GZA's project management capabilities and expertise in understanding and addressing public and town concerns on these types of projects.

Exeter Energy Project (CMS Generation), Sterling, Connecticut

GZA developed and implemented remedial action plans to enable a *tire-fired power plant* to achieve compliance with CWA and CAA requirements pursuant to its NPDES discharge permit and CTDEP air permits. CWA compliance work involved a toxicity identification and reduction program to minimize the impact of the facility's ash management and operating practices on storm water discharges. Aquatic toxicity analyses and evaluation of the storm water management system, operating practices, and ash and other materials handling procedures were conducted to identify sources and components of toxics in storm water discharges. Storm water toxicity reduction controls were identified, evaluated and implemented. The CAA compliance work involved preparation of engineering evaluations and negotiation with the CTDEP to assist the power plant to achieve compliance with emission limits contained in its air permits. Causes for the facility exceeding its combustion efficiency and CO emission limits were evaluated and remedial action options were identified. Recommended options were implemented and enforcement protocols were negotiated with the CTDEP. GZA provides ongoing environmental consulting and regulatory compliance assistance.

New York State Energy Research and Development Authority

GZA conducted a program and prepared a report, *Wood Products in the Waste Stream: Characterization and Emission Testing Protocol* (Contract No. 1531-ERER-ER-91). The purpose of this program was to evaluate waste wood contaminated with paints, resins, preservatives, etc. This waste wood material comes from construction and demolition sources, wood product production facilities or other sources where wood has been previously used and potentially "contaminated" with non-wood materials. Six waste wood processors and two wood combustion facilities were visited and tested. More than 175 individual waste wood samples were collected and analyzed for contaminants. GZA also compiled a database of actual emissions from over 100 wood-fired boilers as part of this contract.

Independent Power Developers - Various

For several independent power developers, GZA conducted *pilot plant R&D* programs where various types of wood were combusted. GZA built and instrumented a small wood combustor able to burn about 25 to 50 pounds per hour of waste wood. Combustion

parameters and particulate and gaseous emissions were collected and analyzed. These studies were used to demonstrate that waste wood can be successfully combusted without causing environmental concerns.

Craven County Plant (CMS Generation)

For the Craven County Wood Energy Plant, a North Carolina power generation facility now owned by CMS, GZA conducted full-scale test burns *utilizing railroad ties*. The information collected was used to prepare permit modification submittals to the state agency so that the permit for the facility could burn a wider range of waste wood materials such as railroad ties. This program, as well as other test burns which GZA conducted utilizing plywood among other materials, demonstrated that *treated wood fuel* could be combusted with lower levels of air pollutant emissions than the pure wood fuel types facilities were previously burning.

New York State Energy Research and Development Authority

For NYSERDA, GZA also conducted a study to evaluate the environmental and economic impacts of a proposed fluidized bed waste wood gasification project to be located in Brooklyn, NY (NYSERDA contract No. 3113-ERTER-94). The goal of the project was to help promote the commercialization of biomass gasification as a more environmentally acceptable and economically attractive alternative to conventional wood combustion. GZA assisted the project owner in obtaining the required environmental permits for the facility. GZA also performed an environmental and economic impact assessment of the project in comparison to conventional wood combustion facilities and analyzed the composition and characteristics of wood fuel from a waste wood recycling facility which was to provide fuel to the gasification project.

Coalition of Northeastern Governors (CONEG)

GZA was retained to test two small industrial wood fired boilers. The primary goal of the project was to determine air emissions produced by small wood-chip fired combustion systems and to determine potential health risks, if any. The test program sampled and analyzed emissions for formaldehyde, aromatics, polyaromatics; hydrocarbons, dioxins and furans, hex chrome, and metals.

Bolivia
Environmental Impact Assessment
National Rural Electric Cooperative

GZA evaluated the environmental impact of a proposed 1.0-megawatt biomass combustion project proposed for Riberalta. GZA demonstrated that there were enough wood waste and Brazil nut shells respectively from lumber mills and nut shelling operations in the area to supply fuel for the power generation facility. GZA met with community business and religious leaders and determined the project would serve the energy and environmental needs of the community. GZA recommended the implementation of the project and use of combustion ash for an agricultural enhancement in the region. The assessment was prepared in Bolivia using World Bank standards and submitted to NRECA and USAID. As a result, the project was constructed and is now operating. The municipal power department is considering adding a second facility.

Indian Project
Environmental Assessments of Indian Renewal Energy Projects
Indian Renewal Development Agency
Asian Development Bank

GZA was retained to establish environmental guidelines for the Indian Renewal Energy Development Agency (IREDA) and the Asian Development Bank to use in loaning funds for renewable energy projects in India. GZA assessed IREDA's resources and staffing, developed a plan to improve the agencies environmental resources, developed environmental assessment procedure's and trained IREDA staff in doing environmental assessments. The work took take place in India.

Bio Energy Corporation
West Hopkington, New Hampshire

Bio Energy Corporation, which operates a 12 MW wood-fired power plant in West Hopkinton, New Hampshire, proposed to expand the type of wood waste fuel combusted at the facility beyond the whole tree chips and clean waste wood (pallets and untreated lumber) then allowed. The initial project involved assisting Bio Energy in obtaining approval for combusting wood panel products such as plywood, particleboard, and oriented strand board. GZA prepared an evaluation of the chemical constituents of these products, which conclude that the only impact on air emissions might be an increase in NOX from the nitrogen in some of the adhesives used.

Subsequent to its receiving approval to use wood panel products as fuel, GZA assisted Bio Energy in obtaining approval to combust cleaned construction and demolition waste wood, including preparation of application documents. Approval from the New Hampshire Air Resources Division for this modification is pending.

GZA has also assisted Bio Energy in correcting deficiencies in its Title V Operating Permit application (originally prepared by others) and preparing a renewal application. GZA staff have also been responsible for National Pollution Discharge Elimination System permitting of non-contact cooling water and boiler blowdown discharges at the site.

Ridgewood Power
Johnston, Rhode Island

GZA is assisting Ridgewood Power in obtaining permits for the expansion of a 14-MW landfill gas-fired power plant at the Central Landfill in Johnston, Rhode Island. GZA's scope of work includes providing advice on permitting strategy, extensive modeling of criteria pollutants from landfill gas control devices and toxic air pollutants from control devices and the landfill itself, and preparation of all permit application documents.

Biomass Gasification Facility Siting and Permitting
Waterbury, Connecticut

GZA provided new facility siting and permitting assistance to Connecticut Renewable Energy, LLC (CRE) on a 26-acre parcel in Waterbury, Connecticut. The former Bristol Babcock Manufacturing facility on 37 and 40 Bristol Street was evaluated by an interdisciplinary team of professionals from several organizations for siting a biomass gasification facility on a brownfield site. The project was funded in part by the Connecticut Clean Energy Fund, an affiliate of Connecticut Innovations. GZA has been providing brownfield funding and redevelopment advisory services, State of Connecticut DEP air permitting services and geotechnical consulting services to CRE since June 2002.

Central Landfill
Rhode Island

Our success on RIRRC projects is the result of a highly motivated GZA Team, technically challenging objectives, high client expectations, and the evolving role of GZA within the operations of the Central Landfill (CLF). GZA has enjoyed a 17-year history with the Rhode Island Resource Recovery Corporation (RIRRC) as their environmental and engineering consultant. We now serve as CLF's in-house engineering staff. With this expanded role came the responsibility of providing all environmental and engineering services required by RIRRC, the establishment of a six person on-site office, and direct involvement with the Executive Director, Deputy Executive Director and Director of Operations of the facility. During this contract, we undertook more than 150 tasks, many of which are ongoing. The highlights of several are presented below.

Superfund Site Investigations

GZA has completed two remedial investigations at the facility for RIRRC under State and Federal guidelines for Superfund studies. The first, Operable Unit 1, evaluated the nature and extend of solid and hazardous waste within the source area – a 121-acre

unlined landfill that operated from 1955 to 1993. The second study, Operable Unit 2, evaluated the extent of offsite contaminant migration via surface water and groundwater flow, landfill gas migration and air-borne contamination.

Our work included:

- Surficial and borehole geophysical analysis;
- Shallow and Deep well installations;
- Groundwater, surface water, soil, sediment, air, landfill gas and waste sampling and analysis;
- Toxicity testing;
- Human health and ecological risk assessment following State and Federal guidance;
- Data evaluation, management and reporting;
- Participation in public workshops, public meeting and hearings.

Our work products, technical opinion and recommendations have consistently been accepted by both the USEPA and RIDEM.

Landfill Closure

As part of our Superfund work for RIRRC, GZA conducted feasibility studies to evaluate innovative waste capping and groundwater migration control methods. Our work was ultimately formed the basis for the closure of the 121 acre unlined Phase I Landfill. GZA also acted as RIRRC's technical representative on the Phase I RCRA C cap design and installation project. Closure of the Phase I Landfill is being conducted in roughly 20-acre sections and is scheduled for completion in 2005.

GZA designed the RCRA D caps for both the Phase II and III Landfill (33-acres in all). The capping systems used for these projects are suitable for active solid waste landfills (i.e., RCRA D) or hazardous waste landfill (i.e., RCRA C). They incorporate a synthetic membrane liner, low permeability soils, and sophisticated geotextile drainage systems to promote stability and prevent erosion.

Permitting, Design, and Construction Management of the Relocation of Cedar Swamp Brook and Phase IV Expansion Cell

Cedar Swamp Brook was an existing waterway and associated wetland located along the southerly toe of the existing landfill. In order to expand the landfill, the relocation of approximately 7,500-feet of the existing brook channel was undertaken by the RIRRC, in two phases, to make way for a new 44-acre lined landfill (Phase IV) and a new 33-acre landfill (Phase V). The stage 1 permitting process had taken a serious time setback and was into its sixth year when GZA was brought on-board. Approval for the stage 1 brook relocation was obtained within three months of GZA's project involvement. GZA was then retained for the entire design and permitting process for the second stage of

relocation which was completed in only 2.5 years. GZA also provided procurement services, construction oversight and management for both stages of relocation.

Design and Permitting of Phase IV and Phase V Landfills Areas 1, 2, 3 and 4 Baseliner

GZA was tasked with the design and permitting of two large expansion cells at CLF. The first was the 44-acre Phase IV Landfill that opened to receive waste in September of 2000 and will be full by 2005. The second is the 33-acre Phase V cell which is just beginning construction and scheduled to receive waste in 2004. Both cells are state of the art double-lined sanitary landfills with full leachate collection and treatment systems. A particular project challenge was that the cells lie over the path of a former stream bed which had to be relocated into a deep bedrock channel and an 800 foot long cut and cover culvert. To maximize the waste volume to footprint ratio, both cells also overlap an existing, capped Superfund landfill. The Phase V cell will also overlap the Phase IV cell resulting in 7 years of filling capacity from a relatively small footprint.
Prior to designing the new cells, the RIDEM Solid Waste Division required that design groundwater elevations for the two cells be established. GZA compressed the time of the approval process through meetings with RIDEM, evaluation of historical groundwater data, and through the use of a groundwater model.

The design of the first two, 11-acre expansion areas of Phase IV were completed on a fast-track schedule which allowed only five weeks to complete plans and specifications for bidding. GZA completed the bid documents in advance of the RIRRC's deadline; construction commenced in April 1999.

Engineering Support of Landfill Operations

Since July 1998, GZA has been providing landfill operations with engineering support. Representative tasks include:

- Wetlands Delineation and Monitoring
- Erosion and Sediment Control Monitoring
- Landfill Settlement and Capacity Surveys
- Site Utility Design and Layout
- Soil borrow assessment
- Pond Bathymetry and Dredging Procurement
- Roadway Layout

GZA has completed these project tasks with the aid of a Global Positioning System (GPS) purchased by RIRRC, and installed and operated by GZA. The work assignments are developed based on the needs of RIRRC's Operation and Maintenance groups. GZA has had to be very responsive to complete many of these tasks as many arise daily and need immediate resolution.

Environmental Compliance and Monitoring

This category includes a wide variety of related and unrelated environmental tasks. Most tasks are required by RIDEM regulations, EPA Superfund or Clean Air Act mandates, or State requirements. Our services have included:

- Sampling, Testing and Reporting for the Storm Water Discharge (RIPDES)
- Sampling, Testing and Reporting of Groundwater conditions as required by RIDEM Solid Waste Regulations and EPA Superfund Requirements
- Air Emissions Permitting
- Alternative Cover Testing and Evaluation
- Wetland Delineation and Permitting
- Emergency Response Actions
- Regulatory Meetings and Presentations
- Property Transaction Site Assessments

We use the Equis System by EarthSoft, a sophisticated chemical and geological information database with GIS capabilities through ArcView, to manage analyze and report on compliance monitoring programs. To date, GZA has logged more than one million records of chemical testing data into our database system on behalf of the RIRRC.

GZA STAFF WASTE-TO-ENERGY EXPERIENCE

WASTE-TO-ENERGY FACILITIES / **Project Location/Capacity**	Permit Plan/Strategy Development	Permit Applications	Environmental Impact Assessments	Siting Studies	Air Quality Impact Analyses	Control Technology Evaluations	Water Quality Impact Analyses	Expert Testimony/Public Hearings/Enforcement Actions	Risk Assessments	Compliance Audit Due Diligence
Albany, NY - 1,500 TPD	■	□	■	□	□	■	□	□	□	□
Alexandria, VA - 975 TPD	■	□	□	□	■	■	□	■	□	□
Ansonia, CT - 1,500 TPD	■	□	□	■	■	□	□	□	□	□
Baltimore, MD - 1,500 TPD	■	□	□	□	■	□	□	□	□	□
Bergen County, NJ - 3,000 TPD	□	□	□	□	■	■	□	■	□	□
Bridgeport, CT - 2,250 TPD	■	□	□	□	■	■	□	□	□	□
Bristol, CT - 600 TPD	■	■	□	□	■	□	□	□	□	□
Chester, PA – 4,300 TPD	□	□	□	□	□	□	□	□	□	■
Hartford, CT - 2,000 TPD	■	■	□	□	■	■	□	■	□	■
Hemstead, NY – 2,500 TPD	□	□	□	□	□	□	□	□	□	■
Henrico County, VA – 334 TPD	□	□	□	□	■	□	□	□	□	□
Honolulu, HI - 1,700 TPD	□	□	□	□	■	□	□	□	□	□
Hudson Falls, NY - 400 TPD	■	■	□	□	■	■	□	■	■	□
Lisbon, CT - 500 TPD	■	■	■	□	■	■	■	■	□	□
Mecklenburg County, NC - 600 TPD	□	□	□	□	■	□	□	□	□	□
Mercer County, NJ	■	□	□	□	□	□	□	□	□	□
Middletown, CT - 230 TPD	■	■	■	□	■	■	■	■	□	□
Morgantown, WV - 150 TPD	□	□	□	■	■	□	□	□	□	□
New Haven, CT - 450 TPD	■	□	■	■	■	■	□	■	□	□
Niagara Falls, NY – 2,250 TPD	□	□	□	□	□	□	□	□	□	■
Norwalk, CT - 200 TPD	□	□	□	□	■	□	□	□	□	□
Passaic County, NJ - 1,500 TPD	■	■	■	□	■	■	■	□	■	□
Philadelphia, PA - 2,250 TPD	■	□	■	■	■	■	□	□	□	□
Pigeon Point, DE - 600 TPD	□	□	□	□	□	■	□	□	□	■
Pittsfield, MA - 360 TPD	□	□	□	□	■	□	□	□	□	□
Preston, CT - 600 TPD	■	■	■	□	■	■	■	■	□	■
Saco/Biddeford, ME – 500 TPD	■	■	□	□	■	□	□	■	■	□
SEMASS, MA - 1,800 TPD	□	□	□	□	□	□	□	□	□	■
St. Lawrence County, NY - 250 TPD	■	■	■	□	■	■	□	■	■	□
Staten Island, NY - 3,000 TPD	□	□	■	■	■	■	■	■	□	□
Wallingford, CT – 420 TPD	■	■	□	□	□	□	□	□	□	□
Warren County, NJ	■	□	□	□	□	□	□	□	□	□
Windham, CT - 135 TPD	□	□	□	□	□	■	□	□	□	□