

N-0856-1-1  
September 24, 2010

Mr. Chris Mason  
Energy and Sustainability Office  
City of Northampton  
Memorial Hall  
240 Main Street  
Northampton, MA 01060

Dear Chris:

This letter is in response to the City's request for Tighe & Bond to complete an evaluation of the existing documents and to formally opine on the feasibility of a small scale hydropower project at the Upper Roberts Meadow Reservoir Dam. As noted in our letter proposal dated September 9, 2010, a cursory review of the studies performed to date and our knowledge of small scale hydropower generation led us to advise you that the Upper Roberts Meadow Reservoir Dam project is not economically feasible. Further study of previous work done for the proposed project has confirmed these original conclusions. Please find enclosed a review of the assumptions and calculations made by each consultant, GZA and Essex Partnership, as well as analysis of the viability of the calculations.

#### **Background/Phase I and II Assessments**

The Upper Roberts Meadow Reservoir Dam is located off Chesterfield Road in Leeds. The dam was constructed in 1883 and is an earthen embankment dam with a stone masonry spillway. GZA was hired in 2006 by the City of Northampton (the City) to perform a Phase I Dam Safety Inspection. GZA concluded that the dam was in POOR Condition and in need of repair. Due to the POOR safety rating, the Department of Conservation and Recreation (DCR) Office of Dam Safety (ODS) issued a certificate of Non-Compliance and Dam Safety Order to the City on June 8, 2007. The Certificate required a Phase II Study to assess the condition of the dam and develop alternatives to address safety deficiencies. GZA conducted this study and concluded that the cost to repair the dam would exceed the cost to remove it by approximately \$625,000. The majority of this cost difference is because the Board of Public Works required 50 years of maintenance costs to be included in the cost estimate for each alternative. Maintenance expenses are about \$600,000 higher in the rehabilitation scenario than in the removal scenario. The Board of Public Works stated that it would eliminate the maintenance cost requirement if it could be proven that operation of a hydro electric turbine at the Site would pay for future dam operations and maintenance costs. Therefore, the City hired GZA to study the feasibility of a small scale hydropower generation system.

In the Roberts Meadow Pond Dam Preliminary Hydropower Evaluation, GZA concluded that the simple payback period for the turbine alone (excluding future turbine and dam maintenance costs) would fall between 58 and 77 years. At this time the Friends of the Upper Roberts Meadow Reservoir and Chesterfield Road Dam was formed by citizens with an interest in rehabilitation of the dam. This group hired another consultant, Essex Partnership, LLC (Essex), to assess the feasibility of hydro power at the dam. Essex did not calculate a simple payback period but determined that the turbine could be economically feasible.

## Assessment of Hydropower Feasibility Studies

It is our opinion that the power and energy production estimate presented in the GZA study is sufficiently confirmed by the Essex study. Both consultants used a local stream and USGS gauging station to determine a flowrate for Roberts Pond and dam characteristics to calculate energy production. Please see Table 1 for each consultant's assumptions of the hydrology and hydraulic characteristics of the Site. Tighe & Bond generally agrees with both consultants on their methodology for determining energy production.

**TABLE 1**

### Energy Generation Assumptions

Parameter	GZA	Essex Partnership
50% exceedence flow rate	20 cfs	16 cfs
25% exceedence flow rate	10 cfs	9 cfs
Height of Dam	35'	30.1'
Gross Head	24'	25.4'
Energy Production Estimate (For 30kW Turbine)	130 MWh	131 MWh

GZA and Essex Partnership also made assumptions with respect to calculation of a simple payback period (for the hydro power generation facility alone) based on predicted energy generation and a cost estimate of the facility. It is our opinion that GZA formulated a more realistic cost estimate, as well as a more realistic projection of revenue based on energy sales. Please see Table 2 for a summary of cost and revenue related assumptions.

The Essex study does not make a recommendation on the cost to design and construct a hydropower system at the Upper Roberts Pond Dam. Rather, they compare this project to a recently installed project that was reported to cost less than \$100,000, exclusive of permitting. Based on our experience with small hydro systems, we believe that this cost is significantly underestimated and does not take into consideration the lack of on-site load (and subsequent electrical equipment required) and local, state and federal permitting costs. Furthermore, Essex Partnership estimates incremental revenue (cents per kWh) that would be expected if the facility had a behind-the-meter load or was able to sell energy at retail price through an allocated net metering program. Tighe & Bond believes that that the proposed hydroelectric facility will not qualify for net metering because, as a Class I renewable energy source, energy allocation under net metering must be towards on-site electricity demand. Furthermore, 220 CMR 18.04(2) specifies that for a non-wind or non-solar Class I renewable, net metering credits will be calculated at the average monthly ISO-NE clearing price. Since the facility will be required to sell electricity at the wholesale price, Essex Partnership has overestimated revenue.

**TABLE 2**  
**Cost/Revenue Assumptions**

Parameter	GZA	Essex Partnership	Tighe & Bond Comment
Cost of Installation	\$750,000 – \$1,000,000	\$100,000	Underestimated by Essex
Cost of FERC Permitting	\$100,000; 5 yrs	\$100,000	In agreement with cost estimate, longer process length possible
Revenue Source	Wholesale	Net Meter (Retail)	Revenue will be wholesale
Revenue (\$/kWh)	\$0.06	\$0.15	Overestimated by Essex
REC Value (\$/kWh)	\$0.04	\$0.025	\$0.04 is a reasonable current estimate. \$0.025 is a better long-term estimate
Simple Payback Period (For 30kW Turbine)	58 – 77	None Given	58 – 77 yrs is a conservative estimate. Payback period calculated with the Essex assumptions will be underestimated.

GZA's estimate of Simple Payback Period may be high due to conservative assumptions. However, Tighe & Bond has used the GZA assumptions with a lower system cost (approx. \$500,000) to recalculate simple payback period in the case that site-factors effecting design and permitting are more favorable and the result was a 38 year payback period. Since the purpose of the hydro power facility is to offset the cost of upgrading and maintaining the dam, it is anticipated that a long payback period for the hydro equipment alone is not acceptable to the City of Northampton. Furthermore, annual operation and maintenance costs were not included in the analysis. These costs could exceed the expected annual revenue. In this case, there is no payback period as energy production at the dam will never pay for the installation of the turbine.

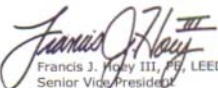
The GZA report indicates that FERC licensing for the project would likely be required and estimates a cost of \$100,000 and five years to complete the process. We agree that FERC licensing would be required, and concur with the potential cost and schedule; but we are also aware of instances where FERC licensing has taken longer. It should also be noted that state funding is no longer available for run of river type hydro projects, in large part because the Massachusetts Clean Energy Center has realized that the FERC process is inhibiting the completion of many of the projects they have funded. In addition to FERC, there are other significant permitting hurdles and costs (e.g. local and state wetlands permitting and possible historic site and Massachusetts Environmental Policy Act permitting) that do not appear to have been considered in either the GZA or Essex assessment that could increase the permitting cost and timeline for project completion.

Tighe & Bond's estimate of the cost and revenue from this project is similar to that of GZA, resulting in what we conclude is an unacceptable payback period for the City. Since the revenue from the turbine project is required to offset dam maintenance costs, the long payback period for the project will not satisfy the Department of Public Works' goal (i.e. provision of an offset to future maintenance costs). Tighe & Bond believes that due to the

long predicted simple payback periods, the lack of available state funding, and the potential permitting costs and timeline, the project does not meet its objective and will not effectively aide the City in paying future operation and maintenance costs associated with the Upper Roberts Meadow Reservoir Dam. Accordingly, we do not believe that additional evaluation of the feasibility of this project is warranted. If you have any questions about our opinion, please do not hesitate to call me at the number below.

Very truly yours,

**TIGHE & BOND, INC.**



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