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**CONSTRUCTION PROJECTS COMMITTEE**  
**THURSDAY, MARCH 27, 2008**  
**NASHUA HIGH NORTH LECTURE HALL**  
**6:00 PM**

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A meeting of the Construction Projects Committee was held at Nashua High North on **Thursday, March 27, 2008**. Alderman McCarthy called the meeting to order at **6:10 p.m.**

Present: Alderman McCarthy, Mr. Hallowell, Mr. Hallowell  
*(Alderman Tabacsko on family commitment, Mr. Kelley is ill)*

Also Present: Mr. Mealey, Mr. Smith, Alderman Flynn, Alderman Teeboom, Mr. Caulfield (Turner Systems),  
Kevin Drew, Rob Punier (Harvey Construction)

***Presentation and Discussion of HVAC Project Options***

**Mr. Mealey**

We have a presentation tonight. There's been a lot of discussion about the fact that initial estimates were for \$4 million. Now, including all possible options we're up to \$23 million. People want to understand where we're at now. We hope to give people an understanding of the different components, options and scope choices that they're going to have to make. I've asked Shawn to make this presentation and we also have Steve Caulfield from Turner Systems here tonight. Steve can address the design we have for geothermal.

**Mr. Smith**

The last renovations to these 3 schools were done in 1991. My predecessor did an audit of the majority of the schools in 1996 and noted that we needed to replace these boilers at that time. In 1997 we lost the first of these boilers in Charlotte Avenue. We then added boilers to our FY98 deferred maintenance proposals. Rist-Frost-Shumway conducted an assessment of these 3 schools and determined that these boilers were beyond their life and did not meet current standards and codes. The ventilation equipment wasn't up to code either. The original estimate was \$3.744 million and we included that in our original request. Now it's at \$4.8 million. In 2006 we hired Turner Building Science as our engineering firm to conduct an energy audit of the 3 schools. They provided 4 options, although only 3 made sense for us. The options range from \$1.5 million to just under \$3 million per school. The air conditioning option is \$800,000 plus. The first option is replacement in kind, the second is to totally replace air-handling system with a displacement air system, and the third is to go with geothermal solar system for heat and replace boilers. The engineering estimate was updated ranging from \$4.5 to \$8.3 million. To add air conditioning would be about \$2.5 million. These estimates did not include any soft costs, including hazardous material removal, architect fees, school movement, contingency fund, etc. Turner's estimates also did not include ancillary work such as lighting replacement, painting or means to improve the building envelope. These things are optional now, but will have to be addressed at some point.

We asked a construction company to review our plans to verify potential project budgets. I contacted Carl Dubois of Harvey Construction to help validating cost estimates for this project. They agreed to help at no cost. They provided a cost estimate of \$20,670,673 for the geothermal/solar option. The estimate included a number of alternates as well as preliminary soft costs. We selected Harvey Construction as the construction manager for the project, after a competitive process and interviewing 5 firms. In the fall, Turner began working with Harvey and they came up with the following option estimates: Option 1, \$10,917,300; Option 2, \$13,735,405; Option 3, \$18,503,123. These do not include soft costs or alternates. It was apparent early on that Option 2 (full air conditioning utilizing chiller units) was not economically feasible due to high electrical costs.

The soft costs are anticipated as follows: hazardous material removal, \$157,625; testing & inspection, \$126,000; moving and storage, \$31,525; commissioning, \$110,338; portable classroom moving, \$100,000; owner's contingency (2%), \$370,062; architect's fees (7.4% of construction) plus reimbursables (\$115,000 was already

obligated, with approximately \$60,000 remaining). The potential construction alternatives for all 3 schools are: roofing, \$1,245,445; light fixtures, \$597,100; painting, \$209,825; window replacement, \$304,615; plumbing, \$26,860; paving, \$142,865; architect's fee (if all alternates are selected), \$186,977; contingency (if all alternates are selected), \$50,546 for a total of \$2,764,221.

We selected Turner Building Science as the A/E for the project. We do not see continued use of multiple unit ventilators as desirable, both from an economical and maintenance prospective. We don't recommend continued use of steam to heat the majority of the school, as it is uneconomical. Therefore, we conclude that an air handling system with forced hot water is the preferred system, as offered in Option 1 or 3. Depending on the variables used in life cycle costing, at worst Option 3 is equal to Option 1; at best it is definitely superior. Option 3 (geothermal) has the additional benefits of: lower utility/operating costs immediately after installation and significant reduction in ozone-layer gases. There's been discussion about solar technology. It's been said that we don't need solar and that's probably true. But Turner feels that solar will add efficiency to the system. We do recommend Option 3, geothermal/solar system design.

The schools that were done in the early 1990's were just done to add on to the school and very little was done to replace the infrastructure of the old part of the school. So the maintenance backlog has just been growing ever since I've been here. We therefore recommend the following alternatives to be approved (listed in order of priority): roofing (building envelope improvement); window replacement (building envelope improvement); light fixtures (replaces original lighting with most efficient fixtures); painting (brighten and improve appearance); plumbing (replaces original fixtures in front wing); paving (replaces failed pavement at Ledge Street and Fairgrounds and paves fire lane at 3 schools). All of these alternates do have additional fees associated with them – architect's fees and contingency.

So, the bottom-line estimates are \$23.6 million for Option 3, \$18 million for Option 2 and \$15 million for Option 1. The cost is undoubtedly an issue. I do think that if we make the right investment to the schools, it will last much longer. The installation of geothermal has the benefit of dehumidification at very little additional cost of construction. Although there is a significant cost to installing Option 3, it will prove beneficial to Nashua over the long haul.

**Mr. Hallowell**

If you go with geothermal and don't go with solar, do you really need a back-up boiler? Is there anything in these packets that I could figure out what that additional solar technology is costing us? I don't think I have that.

**Mr. Caulfield**

I don't have the number in front of me.

**Mr. Hallowell**

Do you think the committee already has that? I can't even find a document that looks like it breaks it out in that kind of detail.

**Alderman McCarthy**

I thought we had seen that document somewhere.

**Mr. Hallowell**

I can't find it. So I guess my request is, I'd like that information. It's an \$18 million price tag for option 3. If we didn't do a back up system of any kind, can you give me a ballpark cost for that?

**Mr. Caulfield**

The kind of solar technology we're talking about is not unduly expensive. The issue becomes that it would be potentially cheaper initially to go without solar and without a boiler system. The boiler system is not for backup, it's for the peak load. The problem would be that your system would become less efficient, particularly at the peak time because the temperature will change underground. The solar allows you to boost that temperature before it goes into your heat exchanger. If you don't have the solar to boost that, your compressors do more of the work and you spend more money on electricity. You'd be most inefficient with a strictly geothermal system.

**Mr. Hallowell**

Dr. Phetteplace made it clear that he did not think that would really be worth it. Do you have evidence to prove that it is worth it? Is there an existing system that shows that this is a methodology that we should be buying into?

**Mr. Caulfield**

We have several systems that are running, but I don't have data on them. We have seen a lot of data on strictly geothermal systems that were installed and not very efficient. They were not performing with the efficiencies that were stated ahead of time. We were called in to see what was wrong, and there was nothing wrong . . . they just weren't going to work any more efficiently that way. I do have a lot of data about straight geothermal systems that show them working excellent at moderate conditions. One of the things that Dr. Phetteplace did show us was the efficiency curve. He showed the temperatures and efficiencies over a year and it was high in the spring and fall and tended to drop off in summer and winter. It changes your efficiency because you're asking the compressors to do the work, and that takes energy.

**Alderman McCarthy**

With regard to the systems that ran inefficiently, do those sites do heating and air conditioning?

**Mr. Caulfield**

Nearly all geothermal systems do both.

**Alderman McCarthy**

What I got out of Dr. Phetteplace's presentation is that particularly in the north, you need to do that. If you don't, you run the risk that next year the ground water around the wells start out colder than this year and then it's always inefficient to run the pumps.

**Mr. Caulfield**

That's not what I took out of the data that he presented where he monitored a well over time. It looked like the temperature dropped rapidly when the season changed, indicating that there was no residual stored heat from the summer, or stored cold from the winter. Within the space of a couple of weeks, the well was way back down. It looked like when they switched over from heating to cooling, the well temperature rose rapidly.

**Alderman McCarthy**

The temperature at the well, but he said the total heat transfer speed in the ground was and he said weeks per foot. It stands to reason that you want the net energy that you put at the bottom of the well to be zero at the end of the year, or absent some inflow of energy elsewhere or it's not going to behave efficient over time. Because you're borrowing it and putting it back.

**Mr. Caulfield**

We are, but it can depend on whether there's water movement under ground. There are typically is some and that's going to carry away heat to it very quickly. We don't want to affect a local area so the wells are not spaced very close together. We try and keep them far enough apart so that they don't affect an area. Everything I've seen from water temperatures coming out of the ground have seasonal variations. But in September 2006, they're the same as September 2007. Certainly if everyone in the neighborhood was doing this, it would have an effect. We've sized this so that you would have six months where you're not doing anything to the ground and it would return to the same temperature whether you do that by putting heat in over the summer while you're cooling, or you leave it dormant.

**Alderman McCarthy**

With regard to solar and the back up boilers, how are we currently doing domestic hot water in the schools?

**Mr. Caulfield**

Right now there's a fired hot water heater. That's what I saw there. There's not a big need for hot water like there is at the high schools.

**Alderman McCarthy**

Would the backup boiler also serve the domestic hot water need?

**Mr. Caulfield**

It easily could.

**Alderman McCarthy**

It seems to me that we do want to cost out what the solar component is. I'm not convinced that we need that piece, particularly if we have backup boilers. We have to have some kind of domestic water heat for domestic hot water anyway. If we can spec that out as a backup boiler that also does domestic hot water, I think I'd be happy with that. Solar may save us on those really cold days, but it is additional upfront cost, complexity, maintenance and I'm not sure we have the data to conclude that it's worth it for us.

**Mr. Caulfield**

I would ask that you allow us to provide you the cost and show you the energy use. We haven't been tasked with that before, so I'd be interested to see it as well.... what the cost and efficiency differential is.

**Mr. Dowd**

We saw there was a need for some ancillary work for lowering ceilings and replacing windows. Does either option show that they pay back the cost for that additional work?

**Mr. Caulfield**

The way we've done life cycle costs for this project are not the typical way we would look at it. We usually look at increased upfront costs vs. energy savings by looking at the cost differential. Here we've been asked to look at not only that incremental cost, but the financing costs on the entire project and all the infrastructure that would go with it, as well as whether that life cycle is equal to that of a lesser option. As Shawn said, it's basically a wash. The 25-year cost of the geothermal solar option is essentially the same as the 25-year cost of just replacing unit ventilators.

**Alderman McCarthy**

I don't think that's the question. The question is, if you break that down and we did everything but the windows we have a certain operating cost that would be higher because we're losing heat through the windows. If we replace those windows, does the life cycle cost the way you're done it, go up or down?

**Mr. Caulfield**

It goes down. We're assuming the same heat loss through the building that we have currently.

**Alderman McCarthy**

Geothermal acts to lessen the value of some of those things.

**Mr. Dowd**

If you made the replacements and you gain something from the windows and lowering the ceilings, do you make up enough efficiency so that you don't need the boiler?

**Mr. Caulfield**

Not in our scenario. I don't think we could make that many improvements to the envelope to decrease the heat load by that much. I think the envelope upgrades that we're talking about are more on the 10% reduction order.

**Mr. Mosher**

Has anyone done a survey of the buildings to determine the actual BTU load that's required to heat the buildings? If so, have they determined how many wells are required to supply those BTU's? Has anyone considered thermal imaging to determine what areas of the buildings need to be insulated to reap benefits? What is the temperature your system would operate at, and how will you extract that temperature from 55 to 50 degree water?

**Mr. Caulfield**

We have not modeled the buildings on a computer scale. We took fuel use data from at least 2 years and compared it to temperature data for the area and back calculated the heat loss. Then we added in the additional ventilation to bring the building up to code. So there's insufficient ventilation going on now in the buildings and we have to

increase the future use of fuel based on the number of BTU's to preheat that incoming ventilation air. We've done all that work, which is how we calculated how many wells we'll need. The principal of the heat pump is that you're not trying to heat with 50 degree water that's coming out of the ground. You're taking the 50 degree water, running it through a compressor and it's using that heat and the work of the compressor to generate much hotter water on the other side. It's the reverse of the refrigeration cycle in the heating mode.

**Mr. Mosher**

You didn't really answer my question. I've asked what temperature you expect to get out of this. 115 degrees from the compressed gas is not going to be sufficient, because you'll have to circulate that air into the building. It would be nice if you could come up with the spreadsheet that was asked for as well as the engineering data.

**Alderman Teeboom**

Dr. Phetteplace said you don't need backup boilers or solar panels and recommended a distributed heat pump system. He had cost estimates way below these numbers here. This committee still has not listened to the presentation by Mr. Maedl who gave an approach using no boilers, no solar panels, distributed heat pump system, kept things in place, didn't tear all these other things down... at a cost of about \$6.5 million. On page 8 of this presentation you have estimates from \$4.5 million to \$8.3 million. What does that \$8.3 million option represent?

**Mr. Caulfield**

It represents the cost of the mechanical systems for 3 schools. Not any of the soft costs or replacement work required to install those. Strictly the cost of the mechanical equipment installed in place.

**Alderman Teeboom**

Didn't you price a geothermal system?

**Mr. Caulfield**

Yes, that's what the third option is for roughly \$8.3 million.

**Alderman Teeboom**

How did that become \$18 million?

**Mr. Caulfield**

As I said, that did not include any of the replacement required or additional work required. It was strictly the mechanical options, not total project options. That was not the entire project. That was looking at 3 different types of mechanical systems and what they alone cost. It didn't include all the parts that would have to be taken out and replaced, the patching, etc. It was not looking at the entire project. We worked with Harvey Construction to look at what pieces would need to be done in addition to get this project done.

**Alderman Teeboom**

So the \$8.3 million was not a system, just pieces?

**Alderman McCarthy**

We've been over this before. And I had asked at a previous meeting, if we had a building that was under construction and got to the point of installing a mechanical system, those the prices of the different options if purchased at that point. They do not include any of the details of doing the construction in an existing building that requires demolition and reconstruction of materials that were demolished. That is how the \$8 million becomes \$20.

**Alderman Teeboom**

I'll have to go back to this. I have the report here. To go from \$8.3 million to \$18 million has no credibility in my opinion. We have a counter proposal of \$6 to install a system and this Construction Committee has refused to listen to that proposal.

**Alderman McCarthy**

Mr. Teeboom, let me tell you what the status is on getting that proposal. I did receive an opinion from Corporation Counsel this afternoon. It's very lengthy but does say Mr. Maedl's offer of voluntary design assistance would prohibit him from providing any construction products or services. So the opinion of Corporation Counsel is, if Mr.

Maedl wants to come and address this committee out of the goodness of his heart, he may do so. But he is prohibited afterwards from providing any responses to bids on the resulting construction project.

**Alderman Teeboom**

I appreciate that. I would like to see that opinion.

**Alderman McCarthy**

I believe you have a copy in your email, and I will make sure it gets forwarded to the rest of the committee.

**Alderman Teeboom**

I certainly want Mr. Maedl to be able to bid on this. I want it to be specified in a way that he can bid on it. If you say solar panels and he says solar panels are not necessary, he's not going to bid on it. He's only interested in doing the construction. I am interested that we take the right approach and don't things that aren't necessary. If you bid this thing and say take all the steam pipes and boilers out, that's not the kind of thing that builds a geothermal system. Have you followed up... it doesn't seem to me that you've followed up on anything that's been presented to you. Your presentation seems to be that that's how we presented it to you months ago and that's how we're presenting it to you again today. I don't see any attempt to whittle this down to an affordable system that's going to get the Board of Alderman's approval for a bond to float this thing. We're wasting huge amounts of time around a system we can't afford. We do want geothermal, but it's got to be affordable. We're wasting all this time talking about things we cannot afford to do. We have to be reasonable. We should get a rock bottom price and then see about adding some options.

**Alderman McCarthy**

Mr. Caulfield, is there anything from Dr. Phetteplace's presentation that is actually not represented here?

**Mr. Caulfield**

Mr. Maedl and Dr. Phetteplace both talked about the heat pump system. Essentially one of several per space. What we're talking about here it seems to me to be the ventilation delivery method... it's not the geothermal system. I think I can agree with them about the underground and heat transfer part. But I think where we get to the heating and ventilation to the room, where I think they're missing the needs of the school environment. They're saying that we don't need a control system for this system because it's a bunch of individual units. But that means that each individual unit has to have a control system. When you're heating that room and there's nobody there, you don't want to bring in the ventilation air so you need a control that turns that off at night.

**Alderman McCarthy**

I think I clearly don't agree that we don't want control systems given the environment these are in. If we look at a different environment where there are always people there, manning the controls, that is different from schools where there is no one on site who cares about the efficiency of the system and doesn't turn the thermostat down, etc. We have made a commitment towards that I think is clear. Are we doing distribution of air that is heating in a central place or are we looking at multiple heat exchanges from the hot water loop?

**Mr. Caulfield**

Our system has some multiple heat exchangers. I think Mr. Maedl's system had several central heat exchanges as well as units out in the rooms. We would have more centralized air handling equipment. I think there would be 6 or 7 rather one per room.

**Alderman McCarthy**

I'm concerned about the end product. I don't care if it's geothermal or not. It is the life cycle cost that interests me. If we're going to do geothermal because it's neat but not do the details of installing the system properly, I quite frankly would rather scrap that project entirely and just do whatever minimal maintenance is required on boilers of the existing systems and wait until we can afford to do the project right with a major renovation to the schools. Doing a haphazard job of putting it in, but doing geothermal so we can say we did geothermal, doesn't really interest me very much.

**Mr. Caulfield**

It's not just the boilers that are 50 years old. It's all the steam piping as well. I think I agree with you though. What we have tried to present is what we feel is a good heating and ventilating system. And that's what we're interested in putting in here. I agree with you completely though.

**Mr. Hollowell**

We're talking about having someone come in and bid on installing this system. Mr. Maedl, if he were to bid on this would come in and install the system. So, Turner is going to do what? You're talking about your system. I think I understand that we're going to take this out to bid, and yet we talk about your system.

**Alderman McCarthy**

Turner is engaged to provide a design for the mechanical system, which will specify what the components of the system are and how they are to be deployed. When we go out to bid, a potential bidder will respond with their costs and how to install them. It is common when we do bids on complex projects for a bidder to come back with alternative options and why. And that's the kind of value engineering we do change orders for. But we do the projects in a separate design and construction phase. And because we now have specified in the ordinances that you cannot be the successful bidder on both of those phases, someone is precluded from designing and building the system at the same time.

**Mr. Hollowell**

Okay. There are other schools with geothermal systems installed. Have we seen them and asked if they like them? Is there data on that?

**Mr. Caulfield**

The construction of schools with geothermal systems is becoming more prominent, but I don't know any that have been operating for any length of time. My only first hand experience is a school in Maine with no back up and frankly is not performing as well as it was intended.

**Mr. Hollowell**

I think Dr. Phetteplace showed at least 2 schools as examples. I think I forwarded an article to the committee that this was becoming a big thing with schools and there were several listed there. So I would venture to guess there are a couple dozen.

**Mr. Smith**

I did a lot of Internet searching and there is quite a bit of data of it. The nearest school I'm aware of is in Hastings, Massachusetts. I can put the data together and distribute it if you want.

**Mr. Hollowell**

This is part of what I'm struggling with. I'm concerned that Turner doesn't have that answer. You (Mr. Smith) just showed me a map with a dozen dots, and the answer I get from Turner is that they've done one. I'm a little concerned by the fact that they're not more aware of what the other alternatives are.

**Mr. Caulfield**

We're aware of schools that have geothermal in other climates. But I was talking about what's going on in northern New England. It's hard to compare apples to apples. Everything is called a geothermal heat pump system. There are open and closed loop systems and variations on both. And the efficiencies can range from 2-15. So that's like saying an old steam boiler is the same as a condensing boiler. They're both boilers but not the same type of system. To our knowledge there aren't a lot of systems and certainly not closed loop systems in New England that we can show you for comparison. There are some in construction and believe, we're watching those. A geothermal system in Pennsylvania is different than New Hampshire, Maine, Vermont, etc. because of different temperatures. The numbers don't always correlate from one part of the country to another.

**Mr. Hollowell**

The one that Dr. Phetteplace showed was from Minnesota, which is probably pretty cold.

**Alderman Flynn**

I haven't been very supportive of this project, but tonight I did benefit from this presentation. Slides 25 and 26 tied together the difference between the \$18 million and the \$23 million for me at least for options 1, 2 and 3. So that was helpful for me. I'm still looking for an understanding on slide 8 we have these total engineering estimates that go from \$4.4 to \$8.3 million for options 1 and 3. Then a few pages later without much discussion we go from \$8 million to \$18 million. Perhaps you can put something together so I can have a better understanding what really happened from \$4 million to \$10 million.

**Alderman McCarthy**

I'll ask them to do that, but I'll caution that often that the reason happens is just growth and understanding. Early on in the project we often come up with an estimate that doesn't include the large amount of the actual work that has to be done.

**Alderman Flynn**

In one of the earlier slides it sounded like some reasonable thought had gone into that \$4.4 million. So it's hard for me to understand that increase.

**Alderman Teeboom**

I'm quite familiar with the procurement regulations and Nashua ordinances. It seems to me there are a couple of ways to approach this project. You can do a design where you specify every small detail. You send it out to bid and look for bidders to do exactly that design. That's one approach. But there's another approach, which I'm more used to. That approach is that you the designer and Harvey lay out a general design. It says here is the space of the building and here's how it's divided up, how many people will occupy those buildings. We want to pull x amount of BTU's and be as efficient to this percentage as we can. That is a system design. Now you have bidders come back and say what they would do to meet that design.

**Alderman McCarthy**

Alderman Teeboom, we're not using that approach. We have contacted Turner to provide the detailed design of the building.

**Alderman Teeboom**

I don't remember the contract getting into that detail.

**Alderman McCarthy**

The contract requires that Turner provide the design and Harvey provide a guaranteed maximum price as the Construction Manager. Now you can't do that if you're going to contract out the designs after the guaranteed maximum price has been established. I want to move on with this because we need to get information to them, so they can come back to us at the next meeting with what we need to make a decision on what we're going to ask them to design. We're not re-discussing tonight how we should do the project.

**Alderman Teeboom**

We're going to ask them to do a detailed design down to the detail?

**Alderman McCarthy**

That's what the contract we signed with them calls for.

**Alderman Teeboom**

Then I think we've taken the completely wrong approach.

**Alderman McCarthy**

You can think that all you want.

**Alderman Teeboom**

I think we're dealing with people who don't have the experience and it's a loser.

**Alderman McCarthy**

Mr. Caulfield, do you have the information you need to come back to the committee with detail on the questions that were asked? I believe I know the questions that were asked and I will work with you on the detail the committee is looking for.

**Mr. Mealey**

I have all the questions and I thought it would benefit us to get all that information together, get it out to the members prior to the next meeting and if we haven't addressed everything they can let us know so that we can have all the information at the next meeting.

**Mr. Dowd**

I'm certainly not opposed to saving money on the project, if we do it right. And not doing some of the ancillary things is not my idea of doing it right. We're not going to leave the schools in disarray after the project is done, even though we have a heating system. Because we won't get the money in the BOE budget to fix it afterwards. So in my estimation it has to be totally complete when the project is done to get my vote. I hope we can save money on the project and get the cost done, because we're under funding the maintenance on our 18 buildings right now. And we have other projects behind these. We've got to get these projects done. We have to stop putting these things off or it's going to cost a lot more money in the long run.

**Mr. Smith**

Just as an update... we're waiting for the contractor to come back and finish the fields. We're waiting for the snow to disappear. The second item is you asked us to look into pumps to move the water off there quicker. We have some quotes and I'll come to you with a proposal to purchase pumps at the next meeting.

**Mr. Hallowell**

At what point do we get updates on what the burn rate on our cash is for these contracts? Is that periodic?

**Alderman McCarthy**

Yes, when we see the monthly invoices. Normally we get monthly invoices from both the construction manager and the architect and it will be in the packet.

Mr. Dowd moved to adjourn. **So voted at 7:42 p.m.**

*Submitted by Jacki Waters*