

Memo from CEI Project Leader John Vancor

—*Characterization and Status of the Current Project*

—*Variability in Cost Estimates Associated Roadway Projects*

Submitted 8/12/08; Supplemented, 9/9/08

I am writing to pass some thoughts about the cost aspects of the review we are performing related to the roadway program.

In some of the recent correspondence, there has been some discussion about cost estimates for different work items being considered. While there is a lot of information from many sources about what different types of improvements cost to construct, this is a very imprecise science. There are many factors that enter into what the ultimate construction cost will be. The best we can do is work together to develop a reasonable opinion of what the likely cost will be.

This work will be competitively bid. The contractor that is both qualified and who submits the lowest bid will be selected. When the contractors prepare their bids they take many factors into account. Their own work load and how much they want a particular project are important. So too is the price they will be able to negotiate with material suppliers. This may vary significantly for different contractors. Also significant is what the contractor will do with surplus material from the project. For example, our project will include removal of the sandy material that has accumulated on the roadway shoulders. If the contractor has a different project where they can use this material, they will bid more aggressively than a contractor who has to find a way to dispose of the material.

The contractor will likely need some subcontractors to complete the work. For example they may need a subcontractor to reset sloped granite curbing. The relationship they have with the subs and the subs backlog of work will influence the contractor's bid as well.

Contractors bidding on projects are faced with balancing different risks. Material costs are rising. Overall work seems to be slowing down. Each contractor will strike their own balance of these risks. Generally projects seem to be coming in at bids that are often low. It is worthy of note that even though the low bidders are may be lower than the Engineer's opinion of probable cost (often called the Engineer's Estimate), there also seems to be a trend toward a very wide spread between the lowest and highest bids.

This project has a very aggressive schedule because the Town wants to advertise for bids this winter in order to try to gain the benefit of the current bidding climate where some contractors are bidding low to try to keep crews busy during slow times.

Having said all that, I want to explain the basis we will go through in developing our own opinion of probable construction cost.

Massachusetts Highway Department (MHD) keeps and makes available current data on all of their bids for various items of work. To the extent practical we will use this data as a basis of projecting construction costs.

Where MHD may not have a significant quantity for a particular item, we may use data from another State DOT that may use that item more often. An example would be the cable guide rail where we will draw on data from Connecticut DOT.

There are other items where we will draw on data from recent municipal advertisements in other communities. Some of the pavement rehabilitation items are examples.

In some instances we will inquire directly of contractors and vendors to try to get a sense of where bids may come in. In these discussions we will not be providing any information that would give a potential bidder "inside information" but rather engage in a general discussion about cost factors.

An example of this would be the red chip seal. The red granite aggregate is not as readily available as it once was. We have found a source that has some and has indicated that they have a significant amount. Although projecting the cost of standard chip seal is relatively straightforward, developing a unit cost for red chip seal involves a little more guess work.

Instead of the material supplier using their own source for the aggregate, we will be requiring that they procure a specific aggregate that may only be available from one source. They will have to factor in their own cost implications to process and supply special batches. This is not to suggest that red chip seal will be prohibitively expensive, but rather to underscore the uncertainty of how bids for this surface treatment will come in.

Pavement Rehabilitation

As we move forward, cost of different components of the project will have increasing importance in the decision making process. While we are getting closer to having a handle on what the pavement rehabilitation can reasonably be expected to cost, we are not quite there. We are still getting back the data from the lab work on the test pit samples. We should be able to draw conclusions on the cost of pavement rehabilitation by the end of the first week in September.

What we know at this point is that Sandy Pond Road and Baker Bridge Road will be more expensive than we had hoped. The depth of good material beneath the pavement is very limited and I expect that full-depth reconstruction will be recommended here. Otherwise I anticipate that the overall program will be comparable to our initial projections. Some roadway lengths will probably require more than first thought some less. We will have more certainty when the lab reports on the existing base material come back.

Drainage Improvements

We have gone out and looked at several locations in more detail from a drainage perspective. There are many locations where shoulder work is needed to restore roadside drainage capacity. In many locations this work will be complicated by the need of the contractor to work around guardrail posts. We hope that the value of the material being removed will make up for the work effort involved and the bids will come in low for this work. As discussed with the Town, we will proceed on the assumption that the sand has covered up existing loam and that the excavation on the shoulder will simply expose this existing loam. For this reason, the contract will not call for the contractor to strip an extra 4 or 6 inches and place new loam.

There are several locations where the puddles occur that will not be resolved by simply scrapping material from the shoulder. In some cases the contractor should be able to grade the new pavement to restore flow to nearby catch basins. In other cases a slight change may be needed in the roadway profile.

Also there are several cross culverts that present concerns. These include locations at Route 126, Trapelo Road and Baker Bridge Road. There may be more culvert concerns identified as we proceed. While replacing or restoring these culverts may be advisable as part of a long term

solution, it may be difficult to accomplish this at all these locations and stay on track with the project advertisement schedule. We will need to perform additional review at these locations before we can make a recommendation on the best way to proceed.

In the several weeks since the last public meeting, we have not yet been able to schedule a meeting onsite with a pipe cleaning contractor to get determine what it would cost to have the closed drainage systems cleaned out prior to finalization of our contract plans. We hope to have this meeting next week.

Traffic Calming Elements

During the first workshop meeting we discussed numerous traffic calming elements. A natural question is “how much does each cost?” The answer is not so simple. In addition to the factors discussed above there is an added element. There is not a standard “hump” nor a standard “raised crosswalk” nor a standard “roundabout”. Each is different. There may be enhancements for streetscape or landscape. Drainage improvements may or may not be part of the work. Special materials may be used in some applications. That is why most sources give a very wide range of typical costs for these elements.

For example, USDOT Federal Highway Administration has data on their PEDSAFE website that would lead to the conclusion that speed humps cost \$1,000 to install on an existing road. However, my own experience on a project two years ago in Plymouth would lead me to conclude that \$3,500 to \$4,000 is a better estimate.

Ranges for other traffic calming elements from various sources:

Speed Table: \$2,000 to \$15,000

Raised Crosswalk: \$2,000 to \$15,000

Splitter Islands: \$4,000 to \$30,000

Median Barrier Application: \$45,000 to \$60,000

Bump-outs (chokers): \$5,000 to \$20,000

Simple Chicanes: \$10,000 to \$20,000

Raised Intersections: \$25,000 to \$100,000

Traffic Circle: \$50,000 to \$100,000

Roundabout: \$100,000 to \$300,000

As you can see, these numbers cover a wide range. As we move forward, if any of these elements were included in the project, we would complete a more specific quantity breakdown to develop the opinion of cost rather than completely rely on these rules-of-thumb.

Overall Project Development

I think we are on track with where we expected to be at this point. This is a unique project development process because the public is being highly involved at early stages. I think this is

going to prove to make this a very successful project. However, I hope that the public understands that we actually are very early in the project development phase.

The advantage of this process is that the public has input before project components are “set”. My concern is that as we move forward there will still be questions where we need to continue to answer “we don’t know yet”.

Our need to wait for the lab test data is an example. So too is our initial review of possible intersection improvements. Our work to date is based on observations in the field. We have not yet received drawings from our surveyor and therefore we are not yet able to prepare sketches of possible changes.

I point this out only to describe where we are at and to make sure we agree on the expectations. With the two goals of advertising the project this coming winter and including extensive public involvement, we simply have to work ahead of data in some cases.

As supplemented by CEI 9/9/08

Presentation of program costs:

Our team will prepare a plan summarizing the projected costs for the recommended roadway improvements. The costs will include pavement rehabilitation, curbing, an allowance for guardrail, drainage system improvements, shoulder improvements to allow for roadside drainage runoff, and an allowance for incidentals.

The biggest cost component will be the pavement rehabilitation. The basis of this cost projection will be the analysis presently being completed. This is a detailed analysis based on the test pit and pavement core testing program as well as on field observation. Although the costs will be summarized, the estimate the summary is based on will be reasonably detailed.

The cost for curbing will be based on a rough estimate of the curbing to be replaced in each roadway segment. It is assumed that bit berm will be replaced with new bit berm. The berm will be low Cape Cod berm to the extent practical. There may be areas where we detail a higher curb because of specific concerns with the quantity of runoff in a particular area. These areas (if any) will be determined during the more detailed design to be performed this Fall.

It is assumed that locations where there is existing granite curb will either have the curb removed and reset, or simply left in place as is. If there are locations where a change of curb type is desired, we can incorporate these changes during the design and plan production efforts.

The cost for guardrail will be an allowance to replace the highest priority rail. We will identify these high priority locations during the design phase this Fall with input from Public Works, Public Safety and the traffic committee.

The cost for drainage system improvements will be rough estimate based on an estimate of linear feet of pipe and a quantity of drainage structures (manholes and catch basins). The actual quantities will not be know until further in the design phase.

A rough estimate will be prepared for the work needed to restore runoff capacity at the roadway shoulders. This number will also be finalized during the design phase this Fall.

The intention of this estimate is to provide a reasonable basis for the Town to easily compare the projected total costs of different roadway segments. There are other features that may be incorporated in the design such as speed humps and raised crosswalks. The costs of these incidentals are expected to be relatively small when compared to the magnitude of the pavement costs.

Pavement Conditions:

As we described during the meeting last Friday, a general inconsistency of base materials for the roadways within the program has complicated the analysis and consequently delayed the development of recommendations for the pavement rehabilitation. Additionally this inconsistency of quality for the base materials, is leading us to recommendations that will call for more extensive rehabilitation efforts than were anticipated based on review of surface conditions alone. We will be prepared on the 17th to describe these conditions as well as the recommendations.

Input from Public Safety

Since the August 27, 2008 memo was prepared, our Team has met with Chief Mooney and Chief Cotoni. We outlined our conclusions regarding several intersections and asked for their feedback. We are continuing to review these intersections and expect to summarize our recommendations in memo form by the end of this week.

Traffic Calming Matrix

A draft matrix was distributed to meeting attendees at the committee meeting last Friday. We understand that additional columns may be added and that the goal is to post the matrix online sometime after the 17th.

Fog Lines

The roadways in the program vary in width. There are many locations narrower than 24 feet. FOG lines will be painted on all the streets in the program. The presence of many street trees and other roadside features precludes consideration of wholesale widening of roadways. MHD recommends use of 11 or 12 foot lanes for arterial roadways. During the design phase, we will recommend lane widths for each roadway segment. The basis will be a practical evaluation of existing roadway widths based on aerial survey. We note that even if 10-foot lanes are used, the result will be narrow shoulders.

Cost Projection Accuracy

Costs are projected based on data from various sources. The actual costs that will be bid by contractors take into account many factors beyond the control of designers, estimators and the Town. While the standard of care our Team is using is reasonable and consistent with industry practice, there can be no guarantee or definition of a "margin of error".

Roadway Segments

We anticipate that the segments to be considered are:

Bedford Road – Route 2A to Route 2

Bedford Road – Route 2 to Lincoln Road

Lincoln Road – From Bedford Road to Codman

Lincoln Road – Codman to Route 117

Trapelo Road

Sandy Pond Road

Baker Bridge Road

Route 126 – Concord town line to Route 117

Route 126 – Route 117 to Wayland town line

Route 117 – Concord town line to Route 126

Route 117 – Route 126 to Lincoln Road

Route 117 – Lincoln Road to Weston town line