REFLECTIONS ON A SEA WALL RENEWAL PROJECT
LAKE BARCROFT 2004

by Mary Laird Silvia and Peter Silvia

Introduction

The following observations and lessons-learned are personal ones gained from a project done at Lake Barcroft in 2004. They are offered to the Lake community in an effort to help our neighbors avoid having to experience the same dauntingly steep learning curve as we did with our sea wall and dock construction. However, we know that our experiences may not in fact pertain to any other project.

**** The authors assume NO responsibility for the success or failure of any other sea wall or dock project based in whole or in part on these observations and/or experiences. ****

1. Permits

As of this writing, two types of permits are needed for a new sea wall: one from Fairfax County and one from the Lake Barcroft Architectural Review Committee. We learned that it is advisable to start the process of obtaining permits two months in advance if possible. The more lead time, the less hassle for all concerned.

Neighbors we consulted experienced from one to seven months' delay in obtaining permits from Fairfax County and one to eight weeks from the ARC. Delays from the county were caused by red tape and hang-ups within the county bureaucracy. Delays from the ARC were inadvertent due to non-delivered mail, but were nevertheless a frustration. Follow-up phone calls to check on the status of the applications were necessary in both cases.

Fairfax County: Officially, Fairfax County says that permit applications should be sent to the Director of Site Development in the Environmental and Facilities Review Division of the Department of Public Works and Environmental Services. However, as of this writing, the person who actually grants the permits is the Chief Stormwater Engineer. We found that by sending our permit application directly to her, with a phone call in advance politely requesting prompt attention, our permit granting process was considerably speeded up.

The Chesapeake Bay Resource Protection Area regulations allow specifically for repair or replacement of existing sea walls. We have had no experience with the special

restrictions or compensations which might be required for a permit to build a new sea wall on a natural or wild shoreline. However, we have heard that making the case that such a wall is necessary to prevent or correct erosion is a useful strategy.

At the County we dealt with:

Ms. Valerie Tucker
Chief Stormwater Engineer
C/o Director of Site Development
12055 Government Center Parkway, Suite 535
Fairfax, VA 22035-5503
Tel: (703) 324-1720; Fax: (703) 324-8359

LBA Architectural Review Committee:

Before we even started planning our project, we looked up the ARC Guildines on the Lake website. Its address is:
http://www.lakebarcroft.org/lib/a-docs/d_archguide.pdf
Docks and seawalls are referred to on page 14.

The ARC permit application form can be found at:
http://www.lakebarcroft.org/lib/a-docs/f_archreview2.pdf

As of this writing, the proper protocol for submitting permit requests to the ARC is to send a completed permit request form to:

Christine Lawson
6425 Lakeview Drive
Falls Church VA 22041

NB: For both the County and the ARC it is necessary to submit a property plat along with the permit request. Our plat turned out to be badly out of date, so we needed a new plat, based on a new survey of our property. This meant extra time for the survey in addition to the permit delays.

We were advised to keep our letter of request as simple and direct as possible. This was good advice.

The ARC requests that, whenever possible, applicants inform their neighbors about their plans and seek any comments they may have prior to submitting their application.

Both the County and the ARC appreciated photographs documenting our need for a new sea wall, even though this was not strictly necessary. We tried to anticipate any questions

or problems that might arise, and planned with care the photographs we submitted so that they supported our permit requests. Our photographs showed the location and damaged condition of our old sea wall, erosion of our lakefront, and problems caused by a tree growing beside a county storm drain culvert. For us these photos paid off both before and during construction, saving more than the proverbial thousands of words of explanation.

The permit we received from Fairfax County came in a form letter from Valerie Tucker. It said that "the replacement of the sea wall at the subject site qualifies as a permitted use under Floodplain Regulations of the Fairfax County Zoning Ordinance, Section 2-903, Paragraph 7, subject to the following [three] conditions…" The conditions were essentially that we follow the Chesapeake Bay RPA regulations.

The permit we received from the ARC was a copy of our permit request letter, marked "Approved as proposed. All work must follow Fairfax County Codes."

NB: It does not work to try to pull a fast one on either the County or the ARC. There are a lot of sharp-eyed neighbors and boaters continually keeping watch over lakeside construction. We understand that homeowners who have tried to ignore the new RPA and ARC rules have lived to regret it.

2. Design Considerations

Before soliciting bids, we boated around the lake, observing and photographing other types of sea walls and noting the special features of them that we did and did not like. We also measured the heights of the various sea walls and docks, plus the length and depth of the docks, and various kinds of steps and ladders leading down into the water, documenting what what appealed to us.

Some people had tailored the height of their docks and walls to the height of their party barges. Others preferred to keep their docks lower for ease of swimming. Still others kept their sea walls as low as possible in order to simulate a natural shoreline.

Sea Walls: The Architectural Review Committee prefers that any new sea wall be built a few inches outside of any existing sea walls, and be constructed. in such a way as to avoid additional erosion or disruption of the environment. Any renewal project should be designed with this in mind.

Looking around the Lake, we noticed a wide variety in type of walls. Most are wooden, but there are also masonry walls of differing materials. We had struggled for years with

an elderly stone sea wall which had become impossible to repair now that the lake's later level is mandated to stay within a very narrow range. We wanted a new sea wall that would be both durable and easy to maintain and repair.

First we considered artificial stone of the concrete-block variety manufactured for use in retaining walls. We hesitated as soon as friends in the trade echoed our concerns about possible spalling caused by repeated winter freezing. Returns are not yet in as to how durable this material will prove to be in the long run. Our final decision against it was made for us when the best contractor we could find reported that the extra sandbags, pumps and special equipment needed to create a viable workspace in three feet of water would make the job prohibitively expensive.

Wooden sea walls are a lot cheaper and easier to build and maintain than artificial stone sea walls, but here again there are design decisions to be made.

Among the other sea walls we inspected, we noticed that many older wooden sea walls and some new ones have a straight face on their lakeside surface, with no cross bracing visible. Although most are surviving just fine, it is unclear whether some or any of these have any form of horizontal cross-bracing behind the lakeside surface to protect against the pressures exerted by soil and backfill against the sea wall itself.

Other new sea walls have one or two horizontal bracing stringers visible on the lakeside surface. This would appear to be a good idea. However in practice it remains to be seen whether ice will get under these stringers and heave them up in the winter. Again, our decision was made for us when only one contractor submitted a bid, and that contractor was comfortable only with external cross-bracing.

Wall Height: The easiest way to set the height of a sea wall or dock is to use either the water level or a given shoreline feature as a starting point for its height. If your sea wall height is to be based on the water level, BE SURE TO ALLOW FOR DROUGHT OR STORM WATER LEVELS ON THE DAYS OF CONSTRUCTION. (The dam can correct high water but not low water levels.) We did not stop to think that our sea wall was being constructed after two weeks of no rain, when the water level was down a full inch below normal. As a result, when rain returned the lake level to its normal height, our sea wall was a full inch lower than we had planned!

Most dismaying was the fact that the structures we had carefully planned to be above ice levels in the winter are now directly in harm's way. Ice can exert exorbitant pressures on wooden structures, and can heave them way up above their original levels. Having lived for years with a drunken looking dock tilted by heaving ice, we had tried to do everything possible to avoid ice damage. But our plans were foiled by everyone's inadvertently overlooking water level fluctuations.

Docks: The easiest and cheapest dock to build is a straight- forward rectanglular, construct-it-as-you-go dock with straight-across planking. Most docks are of this variety, done without a paper drawing, and generally turn out fine.

However, sometimes such a dock is either inadvisable or undesired. Our property predecessors had built a triangular shaped retaining wall on the lakefront behind our old rectangular dock. This had created a space that was never visually satisfactory. In addition, we wanted a dock that would be a bit unusual. So we decided on a trapezoidal deck, slightly overhanging our sea wall, that continued the lines of the triangular patio space on land.

We are fortunate to have a talented engineer-cum-builder in the family, and he worked out multiple designs and variations as we went along. We took a long time and had lots of false starts and disagreements before we decided on the exact design of our new dock.

Some elements of design which passers-by have already commented on are its:

- unusual shape, which conforms to the contours of the landscape and fits in well visually with the triangular patio area.

- cantilevered overhang, which gives us extra dock space without impinging on the lake surface.

- 2x8" dock facing board designed to protect people and party barges from splinters and scrapes from exposed plank ends.

- hinged steps, which are designed to be lifted out of the water in winter to prevent ice damage and retard algae.

A lesson we learned too late is that wooden steps below the water level attract algae very fast. Algae-coated wooden steps are slippery to the point where they can be dangerous. We chose steps over a ladder so as to facilitate entry into the lake for swimming and filling watering cans, etc. As we get older, we increasingly prefer steps over ladders. But we were not prepared for the excessive slipperiness of the steps we created. They will take constant underwater scrubbing to remain even marginally safe to use.

One thing we did right is to put very large square flagstones in the lake bottom at the bottom of the steps. This arrangement has proved pleasant to walk on when entering the lake and is easier to clean debris off of than a silt and muck bottom.

- diagonal deck planking, which adds an artistic element to its surface.

NB: What is sold as premium deck lumber today is pathetic by yesterday's standards, full of knots and warps. Contractors routinely have to order extra lumber so as to have enough usable pieces for a job.

We worked hard to choose knot-free lumber for the decked surface of our dock, but unfortunately we discovered too late that there was not enough clear, knot-free lumber available in our shipment to do the quality job we wanted. By the time we realized what we were facing, it would have taken too much extra time and money to rectify the situation to be worth it. Had we realized the extent of the lumber problem in advance, checked all planks ourselves before construction started, and personally identified the ones we wanted for the dock, we might have been able to avoid disappointment.

- other features. We added new electrical outlets and also a support for our irrigation pump, which is hidden under and protected by the cantilevered area.

Safety considerations included scrupulous ground-fault protection on all electricals, 45-degree angles on all exposed wooden corners, and careful attention to avoid unevenness in all planking and stone surfaces.

3. Construction Options

Neighbors we consulted who had built or rebuilt sea walls and/or docks before us reported difficulty in finding contractors willing even to give them an estimate. So when we heard of three different companies ready to build at the lake, we called them all immediately. Since we were total neophytes concerning sea wall construction, we made a point of asking the estimators lots of questions in an effort to educate ourselves. This really paid off. The information we gleaned from all three of the estimators we dealt with proved extremely useful later on.

Neighbors who gave us contractors' names were all satisfied with the work they received, both in wood and in concrete-based artificial stone. We do not intend this commentary to include a judgment on the advisability of one contractor over another, or one construction practice over another. What we do wish to do is share some of the options we found available. Since all of these options were gleaned from our Lake neighbors, we feel comfortable passing them on.

Some construction decisions we made were based on what our contractor was accustomed to using. Others were chosen for quality, longevity, and/or aesthetics. Various options we considered were:

- Grade of lumber used: premium vs. construction-grade pressure treated. Premium grade was recommended.

- Post size: 4x4" posts vs. 6x6";
- Distance between posts: 4', 5' or 6'.

These options depended on contractors, and height of sea wall or dock. On many docks, 6x6s are used. However, our contractor pointed out that that the predicted lifespan of 4x4" posts is considerably longer than the wall sheathing. Since our wall is very low, we believed 4x4"s sufficient.

- Vertical Sheathing: straight-edged 2x6" vs. tongue-in-groove 2x6" vertical wooden sheathing creating the body of the sea wall. This option was dependent on contractors' building practices. Tongue-in-groove might be marginally more rigid, but for us this was not a significant issue.

- Horizontal Stringers: inside vs. outside placement of the horizontal 2x6' supports for the vertical sheathing, again depending on contractors' pracices.

- Width of sea wall top boards: 6x8" vs. 6x10"

- Tie-backs: wire vs. rod

Some contractors favor threaded rod tie-backs because they allows for nuts to be tightened on the face of the sea wall should it begin to sag.

Our decision was between 7x19 strand galvanized and 1x7 strand galvanized wire. We chose to use the finer gauge 7x19 strand galvanized aircraft wire rather than the heavier 1x7 strand galvanized guy wire that has commonly been used in other sea walls because that is what our contractor was familiar with. The wires were tensioned in place by long levers.

Apparently Fairfax County routinely uses the thinner and more flexible wire for its sea walls and retaining walls. This wire is designed for a fifty-year lifespan, which is more than the forty-year lifespan predicted for the lumber. It remains to be seen whether either lifespan is as long as projected.

- Fasteners: clamps vs. turnbuckles. There is some debate about the value of turnbuckles vs. cable clamps on sea wall tiebacks. In our opinion, the claimed benefit of turnbuckles' adjustability in the event that a cable becomes slack is negated by the turnbuckles being inaccessibly buried in the ground. Turnbuckles also are more expensive and more subject to corrosion than clamps. For this reason we chose to use simple cable clamps, thoroughly coated with roofing tar.

- “Dead-men”: horizontal vs. vertical; wood vs. concrete. Sea walls are anchored by being tied by wires to wooden posts or poured concrete slabs called “dead-men” buried back onshore. Wooden “Dead-men” are preferably laid in a short trench horizontally, forming a “T” across the onshore end of the wire tie-back. However, if laying them correctly would mean damaging significant tree roots, they are driven into the ground vertically. Under no circumstances should tiebacks ever be tethered to tree roots.

- Inclusion or not of a facing board on the outside edge of the dock. If so, size 2x6” or 2x8”.

- Backfill: The life of any sea wall is affected by the backfill used behind it. Dirt is what rots wood. Therefore, though dirt is cheaper, for maximum lifespan it is important to have a layer of stone or gravel between wall and land to minimize rot.

The height of any sea wall relative to the land behind it determines the amount of backfill needed. If the height of the finished wall is to be several inches higher than the prior land level, many tons of backfill may be needed. Expense will be determined not only by the quantity and quality of backfill needed but also the time and difficulty needed to install it.

The least expensive type of backfill is crushed concrete rubble from building sites. One of our neighbors chose this option. What we did not expect was that the truckloads of rubble would arrive in front of the house in huge chunks, complete with metal reinforcing wires, which then had to be jack hammered into pieces small enough to transport by wheelbarrow...some sixty tons of it! Listening to the jack hammering day after day for nearly a week, plus the constant need to monitor the process in order to prevent damage to the driveway, created its own stress independent of the rest of the job. Anybody considering choosing the rubble option should keep in mind the need for jack hammering before deciding. Another consideration for any form of concrete placed anywhere near trees is that concrete leaches out alkali, which is not good for acid-loving trees such as oaks, etc. which we have many of around Lake Barcroft.

Other than concrete, either or both stone and gravel may be needed for backfill depending on the height of the finished sea wall. The largest size of stone is gabion stone. Slightly smaller is surge stone. Smallest is common #57 gray gravel. Note that #57 is to be distinguished from #21A gravel, which also contains stone dust and which is used to create a solid foundation upon which to build a patio or a road. #21A is not recommended for seawall backfill.

After our job was over and rain had washed everything clean, we discovered that the bucket tines of the bobcat used to transport stone had left noticeable gouges in our newly-paved street. This was of course unintentional, but it is a hidden hazard if a bobcat is needed.

4. Construction Practices: Price vs. Longevity.

For some people, price is the controlling consideration regardless of whether or not inexpensive construction will shorten the life of a sea wall. We chose to spend more now, for the longest lasting construction possible, because we hope to be here for many years more. Therefore we opted for practices that would increase the lifespan of our wall, such as:

. Premium grade pressure treated lumber.

. Coating all wire tie-backs and galvanized wire-clamps with roofing tar. Since we were using the thinner wire, we wanted to make double-sure to protect it, so we personally coated all our wires and post tops with roofing tar. Some contractors do this routinely. Ours would have done it for us, but for several reasons we preferred to do it ourselves.

. Placing plastic-coated _" rat wire mesh (from Home Depot) inside the wooden sea wall to foil muskrats. We had noted that some other sea walls had muskrat holes gnawed through them.

. Insisting that at least 12" of surge stone and #57 gravel backfill be placed between our sea wall and soil. To stabilize the area where gravel and soil meet, we personally laid down a layer of permeable black landscaping cloth (again from Home Depot) before any soil backfill was added. This will prevent soil from migrating into the gravel, prolonging timber lifespan and minimizing subsidence of soil levels.

Access across a property to any sea wall from the street will determine whether the tons of backfill needed can be transported by bobcat, which is by far the cheapest and easiest way, or whether it must be carried by wheelbarrow.

Here there is a trade-off in speed and low price in construction versus damage to the property. We were lucky enough to be able to have a little of each. The heaviest of the stone was taken by bobcat, thanks to our neighbors' forbearance. The remainder we either needed or chose to have wheelbarrowed. To save our fragile, mossy backyard, we laid down strips of plywood end to end in such a way as to prevent hundreds of wheelbarrow trips from forming ruts in the soil and destroying the moss. Slippage of the plywood was avoided by screw-gunning the planks together. One wheelbarrow tipping over was enough to make us concerned about safety on the long steep hill between our house and lakefront.

6. Dealing with the Contractor

Checking out Both Contractor and Construction Crew in Advance: Contractors control the management of any job, but the crews who actually do the work are the key to the quality of workmanship delivered. Careful selection of contractor is crucial to any successful and happy job.

We used two sources for finding and choosing our contractor. First we turned to the LBA website "Contractors and Services":

http://www.lakebarcroft.org/cm/contr/select/shtml

The section entitled "Selecting a Contractor" is very helpful. It is important to ensure that your contractor is licensed by the county and has liability insurance for himself and his crews.

The "Lake Link Contractor List" is a great source for contractor references. In addition, we contacted other people we know who had already completed sea wall projects. We talked at length to these people, questioning them closely as to the both the quality of work received and the pleasantness of their experience in dealing with both contractor and crews.

We asked specifically about what worked well for our reference-givers and what did not, both in terms of construction and in personal relations, specifically:

.How much honesty and integrity could we expect from the contractor in question?
.What value did he give for money?
.What was the skill level of his workers?
.What was the general quality of his company's work, including materials?
.Did he and his group try to cut corners, and if so, how?
.How easy or difficult was he to deal with, and if so in what way, etc.

Our friends gave us valuable pointers.

Shared Understanding: Neither of us likes unpleasant last-minute surprises. For this reason, we explored thoroughly in advance with our contractor what a "good quality job" should look like, in great detail.

We wrote down everything. We described in words, sketches and drawings exactly what we wanted and expected. We made sure it was all in the contract. And we were adamant about permitting no cutting of corners. If the contractor or one of his crew did anything even bordering on we didn't like, we called them on it immediately, before anything went too far off track.

The more specific you can be about your expectations, the more likely you will get a job that satisfies you. For example, do you want the equivalent of a bare-bones economy automobile, or do you expect a Lexus fully loaded with all the bells and whistles? Be

crystal clear about what your want and write it down. Being unequivocal and consistent up front goes a long way toward avoiding misunderstandings.

Finances: Most contractors want in the neighborhood of 50% down and 50% upon completion, but percentages do vary, so it is worth knowing them in advance. We were careful to hold on to our final payment until we were sure we had what we had contracted for and our job was complete.

7. Crew Considerations

It is a fact of life in Northern Virginia that most construction crews include foreign-born workers who may speak little or no English. Communications can thus be difficult, and it is easy for inter-language, cross-cultural and inter-personal problems to arise.

Our crew had four men from three different countries and two continents. All had arrived in the U.S. within the last nine months, and only one of them spoke reasonable English. They had not worked together before our job. It was thus not surprising that we experienced plenty of all the above-mentioned communications glitches despite everyone's best efforts to avoid them.

Mistake-prevention: In order to catch and nip in the bud as many design/building problems as possible, both of us monitored all aspects of construction multiple times each day. Where necessary or desirable, we helped in details of the work and cleanup ourselves. This paid off many times over. There's nothing like being right there to say and/or demonstrate, "Well, I'd prefer this one inch to the right, or at a slightly different angle; please remove that bit of debris before tomorrow's trash pickup," etc. It helped avoid all sorts of difficulties.

Performance quality and good crew morale: Most mistakes and accidents occur among upset, disgruntled, tired, hungry or dehydrated workers. Making sure any crew has easy bathroom access and plenty of water at all times, adequate respites, and an occasional coffee, soda or late-afternoon treat to keep their energy high during a long summer day of heavy labor pays good dividends in terms of better job performance.

On other jobs, we have witnessed crew members unable to afford any breakfast, lunch or snack until they were paid at the end of an entire hard working day. Not surprisingly, they were the ones with the least energy and the most errors.

To avoid a similar situation in our sea wall project, we kept a close eye out for our crew's well-being. We noticed the toll taken on all of them by long hours hauling over a hundred tons of material by wheelbarrow up and down a long steep hill. They were

clearly knocking themselves out for us. We felt the least we could do - at a minimum in our own best interest - was to ensure that all crew members had adequate support at all times. In return, we were richly rewarded by having a talented, highly motivated and hard-working crew who went out of their way to please us every day in every way.

Time-saving: Lending the crew our own garden tools (clearly marked as ours) avoided delays caused when specific tools of theirs had inadvertently been taken to or left at another site, or if two tools were needed and only one had been provided by management, etc. Some of our tools, such as a four-tined grub rake and hand mattock, the crew had never seen and found very useful and time-saving. Of all the things we did to help our crew help us, this was one of the easiest, with the highest cost/benefit ratio to us.

Intercultural/interpersonal relations: The crew on our project came close to meltdown on several occasions, largely for intercultural and interpersonal reasons. Salvaging the situation took a lot of effort. At the risk of appearing politically incorrect, the following are the lessons we learned in the process of helping keep our best workers on the job:

- To resolve the language problems alone that arose, we needed to rely on many kinds of gestures, sketches, dictionaries, body language and efforts at shaky Spanish.

- Some workers can appear super-sensitive and perceive insults where none are intended. Immigrant crews know they are at a disadvantage. They all know that their job security – and often their families' next meal - depend on the quality of their work from one day to the next. However, they do not necessarily like the jobs they have to do. Those who have held responsible jobs in their countries of origin can find it difficult to have to do manual labor. Refugees and Latins in particular can arrive so penniless, and are so frequently held in contempt by others, that often they have nothing left but their pride.

As one worker put it, "I may not be very tall, and I may not speak English, but I am still a man. I am not a pack animal. No matter how little I have, I am still a person, and I still have my self-respect. Regardless of how lowly my job may be, I take pride in doing my job well. At the end of the day, I must still have my self-respect. It's the most important thing that I have."

- The culture of construction workers is a tough one. Praise is often hard to come by, while criticism is frequent. So workers of all kinds usually respond well to being called by name, being treated like intelligent human beings, and to receiving both encouragement and compliments when they do good work. The saying goes, "You catch more flies with honey than with vinegar." Throughout the course of our job, we had more than ample opportunity to experience the truth of this maxim.

Conclusion

The process of creating, reconstructing or replacing a sea wall well is not an easy one. It is complex, time-consuming and expensive. We spent a lot of time and energy on researching the best, most cost-effective and energy-efficient way to do ours. In spite of our best efforts, we made a lot of mistakes and had more disappointments than we would have liked.

It is our hope that the above information will help our neighbors have an easier and more effective time of it than we did! If we can pass on the benefit of the lessons we have learned, then the struggle will have been worth it.

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