



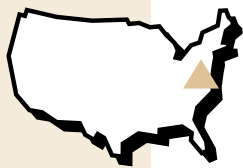
▶ CASE STUDY: WATER APPLICATION

Walls Protect Housing Development From Flood Waters

Due to ever increasing building costs and land shortage, Keystone Retaining Wall Systems are helping developers make use of sites that were previously considered unbuildable. In early August, 1995, Sterling Homes, a homebuilder located in Baltimore, MD, was developing land that included property on Stoney Creek. Stoney Creek is a tidal area that is wide and subject to wave action from pleasure boat traffic and occasional flooding. A retaining wall was needed to replace a collapsed concrete crib wall previously installed on the property and to provide stability to the shore line. The walls would also provide additional buildable land area which would enable the continuation of the townhome development, providing residents with usable back yard space.

Keystone was chosen for this project in part for its visually pleasing quality which helped improve marketability of the project. The design engineers, Dove and Associates of Chantilly, VA, worked closely with Sterling Homes to produce the final wall design.

The installation bid was awarded to Fine Earth Landscaping, Inc. out of Poolesville, MD. Joel Hafner of Fine Earth, Supervisor on the project stated, "this is the hardest job I've ever done". The wall had to be constructed in 50 to 100 foot (15 - 30m) sections at a time, due to the close proximity of the existing townhouses and the potential to undermine the building foundations. At one point, the wall came within 10 feet (3 meters) of a deck on one of the existing townhomes, which almost collapsed during construction due to an existing cracked footing. Another problem Joel encountered was ground water from



- ▶ **PROJECT:** Stoney Beach
- LOCATION:** Baltimore, MD
- PRODUCT:** Keystone Standards
- SQUARE FOOTAGE:** Sterling Homes
Baltimore, Maryland
- CONTRACTOR:** Dove & Associates
Chantilly, Virginia
- SPECIFIER:** Fine Earth Landscape
Poolesville, Maryland
- KEYSTONE REPRESENTATIVE:** Betco Block & Products
Bethesda, Maryland



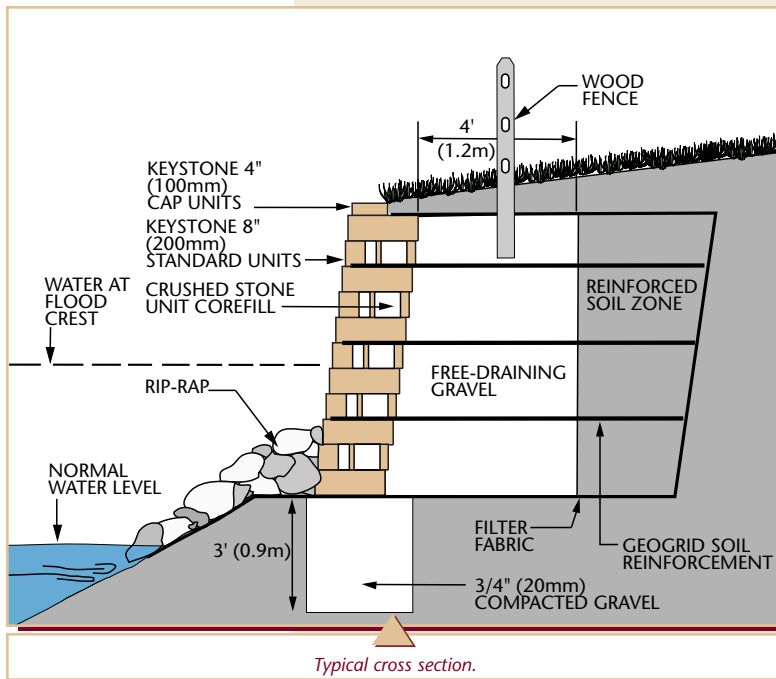
Keystone Walls offer an aesthetically pleasing solution at Stoney Beach while providing stability to the shoreline.

a sediment pond at several sections of the wall. The project had to be stopped and re-engineered to account for the high moisture content of the soil in the vicinity of the sediment pond, which added additional geogrid. The 8,400 square foot wall is 900 feet (274m) long with maximum wall heights of nine feet (2.7m). Keystone Standard Units with the 3-plane rock-face texture were used on the project. They were placed on 3 feet (0.9m) of compacted 3/4" (20mm) gravel to overcome a soft base sub-soil condition. The project used approximately 3,000 square yards of Mirafi 5T & 7T with embedment lengths between 9 and 10.5 feet (0.9 - 3.2m). The wall design also called for



Installing the rip-rap at the base of wall.

four feet (1.2m) of free draining gravel behind the wall to provide release of hydrostatic pressures caused by flooding. 700 tons (635,000 kg) of armour stone (rip-rap) was placed in front of the wall to stop the water from eroding the base of the wall.



Typical cross section.

A wood fence was installed on top of the wall to provide a guardrail barrier and to complete the yard space provided by the Keystone System. Total cost for the project was approximately \$200,000 with an average per square foot cost of \$19.64. The rip-rap in front of the wall added an additional \$35,000.00. The project was completed in late January, 1995.

The wall was put to the test in the winter of 1995/96 when flood water crested nearly half way up its face. Some of the beach was lost but the Keystone wall and rip-rap remained in place as a testimony to the durability of the product and system!

