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Shoreline Infrastructure in Conception Bay South, Newfoundland

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ABSTRACT

Conception Bay South is a large municipality located on the northeast of the Avalon Peninsula. This municipality contains nine communities which have a total of approximately 20 kilometers of coastline along Conception Bay. A vast amount of housing is built along these scenic shorelines that overlook the Atlantic Ocean. Unfortunately, much of the water and sewer in this area runs adjacent to the shoreline and this poses a threat to the town's infrastructure.

As time passes, the shorelines constantly erode and wear away. This causes problems with the amount of ground coverage that is protecting the buried infrastructure. The water and sewer pipelines are at a danger of becoming exposed to waters of the Atlantic Ocean. Immediate action must be taken to prevent this infrastructure from being damaged.

Different types of coastal structures will be look at and evaluated. There are many cases of success and failure of structures along the Conception Bay South coastline.

The following will show examples of what has happened to the current shoreline and what could happen if immediate action is not taken.

1 INTRODUCTION

The municipality of Conception Bay South is located at the northeast end of the Avalon Peninsula along the east side of Conception Bay. Conception Bay South is approximately 10 km to the west of the City of St. John's and it shares its boundaries with the Town of Paradise and the Town of Holyrood. Figure 1 will show the detailed geographic location.

Figure 1: Location of Conception Bay South on a map of Newfoundland
(Source: http://en.wikipedia.org/wiki/Conception_Bay_South)

There are nine communities that make of the municipality of Conception Bay South. These communities are Topsail, Chamberlains, Manuels, Long Pond, Foxtrap, Kelligrews, Upper Gullies, Lawrence Pond and Seal Cove. These separate communities were incorporated as a municipality in 1973.

Conception Bay South has approximately 20 km coastline along the east side of Conception Bay. Due to the scenic views of Conception Bay, many of the residents have built homes along the coastline. Many of the homes are serviced by water and sewer infrastructure that runs parallel to the water's edge. This shoreline infrastructure has to be protected from the pounding waves of the North Atlantic Ocean. Breakwaters and revetments have been designed and placed along the shoreline to protect the buried infrastructure. Over the years, some of these breakwaters and revetments have proved to be a worthwhile investment, while in other areas they have failed.

2 COASTAL STRUCTURES

2.1 Breakwaters

Breakwaters are used to protect the shoreline, harbours, and its associated infrastructure from the damaging forces of wave action. There are several types of commonly used breakwaters. They could be rubble mound, steel sheet piles, stone-asphalt, and concrete caisson. The breakwater type that is most commonly used along the Conception Bay South shoreline is the rubble mound.

Rubble mound breakwaters consist entirely of earth materials. These materials range from finer materials in the core of the mound to large armour stone that is place on the exterior of the breakwater. These breakwaters are sloped to help to dissipate the energy from the wave and the shallower the slope the more affective they are. The cost of rubble mound breakwaters increases exponential as the depth of the water in which they are located increases.

2.2 Revetments

Revetments are used along the shoreline as a sloped protection against wave action. Revetments can be made of large boulders, concrete blocks, or concrete structures. When using concrete clock or

concrete structures the revetment is known as rigid while the use of armour stones creates a flexible unit.

There are many areas along the Conception Bay South shoreline that amour stone revetments are used. These sloped rock barriers act in a similar way to breakwaters because the sloped side helps to dissipate the energy of the waves so that no damage can occur. This type of structure has been proven affective in minimizing any potential damage that the waves may cause.

3 SUCCESSES

The Town of Conception Bay South displays many fine examples of successes when using breakwaters and revetments. The main success comes from the added protection that these structures add to the infrastructure that is placed in the ground behind it. Residents of the town rely on this infrastructure to provide a better quality of life. The following are a couple of the key successes for these coastal structures.

3.1 Breakwater Along Lance Cove Pond

The boundary between Lance Cove Pond and Conception Bay is a breakwater. This breakwater has a shallow slope and the exterior is covered with large cobble stones. The purpose of this breakwater is to shelter the pond in which it surrounds. Lance Cove Pond has many residential houses located around its exterior and due to the protection from the breakwater; this pond is sheltered from the powerful waves generated by the Atlantic Ocean. This shows how a proper breakwater can protect areas that are more susceptible to damage. Figure 2 shows the breakwater with Conception Bay to the right and Lance Cove Pond to the left.

Figure 2: Breakwater location at Lance Cove Pond
(Source: Personal Photo)

3.2 Revetment Near Anthony's Road

Along the shoreline near Anthony's Road in Conception Bay South lies a revetment. This revetment consists of large armour stone that is placed along the slope of the shoreline. There is a medium slope on this revetment which is designed to disperse the wave energy that hits it. During high

wave action, the waves will ride up the slope until its energy has been depleted and is not harmful to the surrounding area. This helps to protect the water and sewer infrastructure that is buried in the buried just beyond the revetment. Figure 3 shows the revetment with large armour stones protecting the slope.

Figure 3: Revetment located near Anthony's Road
(Source: Personal Photo)

4 FAILURES

Although there are no cases where a breakwater or revetment has failed in the Town of Conception Bay South, there are many instances where they would be neared. These instances are located in areas where damage is apparent from crashing waves of Conception Bay. In these areas the ground is being eroded. This erosion can be potentially very damaging to infrastructure if it were to become uncovered. If unearthed, the infrastructure would be completely exposed to the elements and this could cause expenses damages. The following describes three areas in Conception Bay South where coastal structures will be required to prevent any further damages.

4.1 Cherry Lane

The shoreline that is perpendicular to Cherry Lane in Conception Bay South is eroding away. This is due to the powerful wave action that affects the area. If left alone, this eroded section will soon expose the existing sewermain causing extensive damage to the infrastructure. This would be a major inconvenience to the residents that are connected to this service. Figure 4 shows the extent of the damage that has been caused the waves.

Figure 4: Damaged shoreline near Cherry Lane
(Source: Personal Photo)

If there was a revetment present then this damage would not have occurred. The revetment would have directed the power of the waves up the slope and keeping it from eroding the softer materials that lie beyond it. This would prove to be effective in protecting the buried infrastructure from being unearthed and potentially damaged.

4.2 Goodland Road

Goodland Road runs parallel to the coast of Conception Bay. The waters of the bay have caused major damage to the shoreline. There is no breakwater or revetment present in this area, so therefore the wave action is at its full intensity. This wave action is exposing the infrastructure that is in the area. As seen in Figure 5, the stormwater pipes that connect to the headwalls are completely exposed. This happened from the pounding waves carrying away the earth around the pipes. These pipes could become severely damaged and have to be replaced, costing the town a large expense.

To avoid any future damages, a coastal structure should be built in order to direct the energy of the waves away from the shoreline where important infrastructure is buried.

Figure 5: Exposed infrastructure along Goodland Road
(Source: Personal Photo)

4.3 Gully Pond Road

Near Gully Pond Road in Conception Bay South there is a steep embankment that is eroding away due to the wave action from Conception Bay. This embankment has no protection from the powerful waves. There is no armour stone or any rock covering the slope. It is completely cover with topsoil. This material is easily washed away by the ocean during stormy weather.

To better protect this embankment from eroding further and causing damage to the underground infrastructure, the slope should be cover with a large stone. An armour stone would provide the best defence from the wave energy. The slope and tough materials will help to dissipate the wave energy and prevent any additional lose of ground materials. Figure 6 shows the steep slope of the eroded topsail that is in danger of exposing buried infrastructure.

Figure 6: Steep embankment near Gully Pond Road
(Source: Personal Photo)

5 CONCLUSION

Coastal structures play an important role in protecting the preserving our coastal environments. Without them we would be leaving it to chance on whether or not are shorelines are safe. This also goes for the underground infrastructure. If coastal structures such as breakwaters and revetments are not properly places and constructed, then they will not be able to perform their duties as planned. They could fail resulting in the damage of buried infrastructure.

Any breakwaters or revetments that are in place should be periodically inspected to ensure that they can withstand any force that comes into contact with it. Also, there are many areas along the shoreline of Conception Bay South that would greatly benefit from a coastal structure to help to dissipate the energy from wave action and to protect the existing infrastructure that is currently in the ground.

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