Considerations for Bio-Retention Ponds

They go by many names such as bio-retention ponds, basins, cells, or rain gardens, but their purpose is clear. They are designed to capture and filter polluted water from adjacent parking lots. **Bio-Retention** is the process in which sediments and contaminants are removed from stormwater runoff from nearby paved surfaces. The bio-retention pond is an area that typically consists of a grass buffer strip, sand bed, ponding area, organic layer or mulch, planting soil, and plants that are used to treat the stormwater. Runoff passes over or through a sand bed, which slows the runoff's velocity and distributes it evenly along the length of the ponding area. It is important that the pond is graded properly, and the center is depressed to hold the water. Depending on the design depth, water is ponded and gradually infiltrates the bio-retention area or is evapotranspired, which is the process where the water will evaporate or move through the plants. Either way, the goal is to capture, treat, store and/or remove the water.

The bio-retention area is graded to divert excess runoff away from itself. Stored water in the bio-retention area exfiltrates over a period of several days into the underlying soils. This is where Allan Block retaining walls are being used, to help grade the site for proper drainage. However, anybody familiar with the industry knows that water is the #1 enemy of all retaining walls. Therefore, it is very important to understand the design requirements of the bio-retention area and handle the water properly.

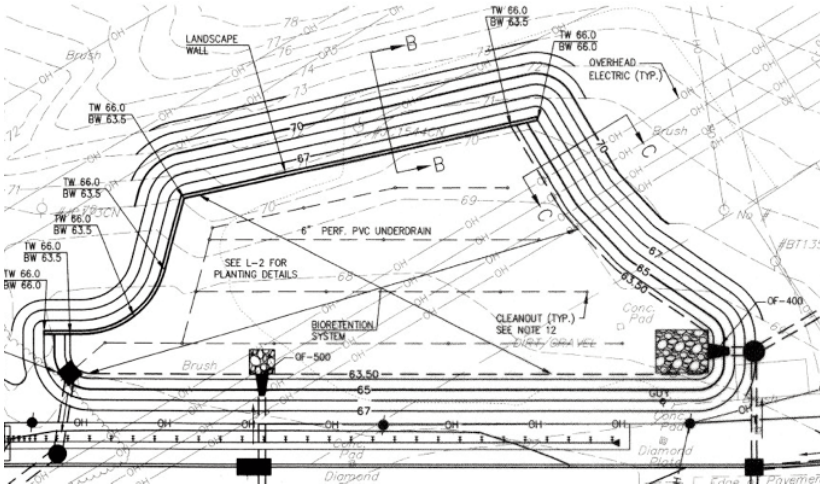

Figure 1: Example of a wall being used to minimize grading

Retaining Wall Considerations

Location: The location of the bio-retention pond in relation to the retaining wall is crucial. When we see these applications below the wall, since land is a premium, the Allan Block wall is used to create the pond without sloping the sides (Figure 1). For this reason, sizing must be considered. When designing a bio-retention area, the designer needs to first determine the intended purpose of the pond, for example:

- What are the site requirements for water quality and quantity control? Will the bio-retention pond be used to address both water quantity and quality or just one of the issues?
- What design storm is required to meet the storm water management criteria of the city, county, state or province. An example is handling the first 6 in (15 cm) of rainfall during a 24-hour period.
- Is the facility used independently of other practices or is it part of the treatment plan approach?

Very seldom have we seen the application placed above a segmental retaining wall. Since the ponds are designed to retain water, it is not desirable to have them located immediately behind the wall. In good practice, they should be located behind the back of the wall at least 100% the height of the wall.

Water Management: Water is going to be present in front of the wall. Therefore, water elevations need to be understood so the retaining wall can be engineered to accommodate them, very similar to the standard water applications that have been used in the past. These considerations are highlighted in Chapter 5 of the Best Practices for SRW Design. These include:

- Wall rock placed behind the wall within the entire infill area to a height extending at least 1 ft (30 cm) above the potential high-water elevation.
- Embankment protection fabric should be used under and behind the infill mass to a height of 1 ft (30 cm) higher that the high-water mark.
- Drain pipe placement may be job dependent, but there are two options to consider. If there is an underdrain to the bio-retention pond, the drain could be placed at the bottom of the wall (Figure 2). With no drain, one should consider moving the pipe above the soil media.

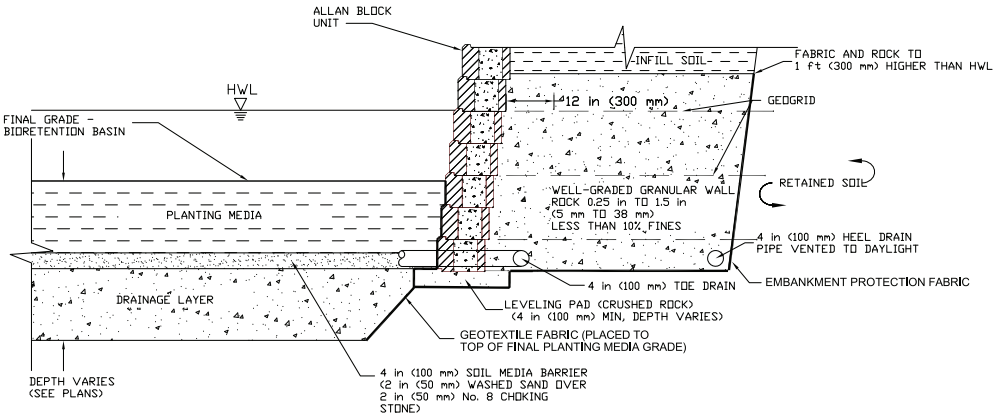

Figure 2: Bio-retention Typical Reinforced Wall Detail High Water Level (HWL)

Embedment: Maintenance might require removal of the soil planting media if it gets clogged with sediment from the water runoff. Therefore, it is recommended that the block be embedded below that layer (Figure 3), or structural fill be placed in front of the block that will not be removed (Figure 4). Often times, the block is embedded at the same elevation as the drainage layer.

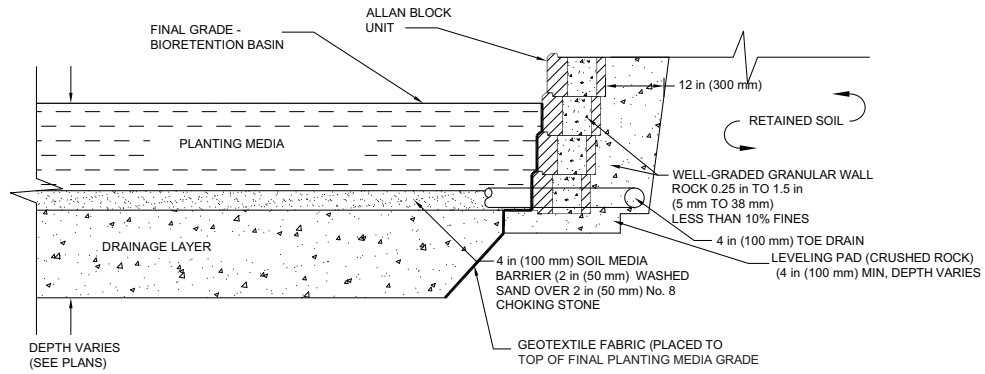

Figure 3: Bio-retention Typical Gravity Wall Detail A

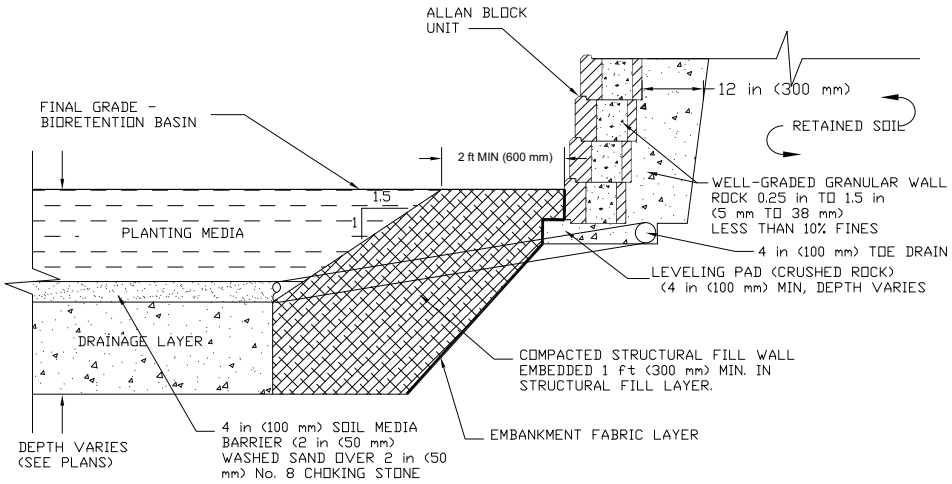

Figure 4: Bio-retention Typical Gravity Wall Detail B

Allan Block retaining walls can offer an excellent solution to space limitations and grade changes surrounding bio-retention basins. Before designing any retaining wall adjacent to a bio-retention basin, the size of the wall must be considered to accommodate for the stormwater management criteria of the city, county, state or province. Water management systems such as wall rock, embankment protection fabric, and drain pipes should be properly installed. Block should also be embedded below the planting media layer, or structural fill should be placed in front of the block.

With these considerations, Allan Block retaining walls will provide more usable space and increase volume, while maintaining the benefits that a bio-retention basin provides.