1. Introduction

Greer Galloway was retained by St. Lawrence College to design a parking lot expansion at the Kingston Campus, as the current parking lots do not provide sufficient parking to accommodate increasing enrollment. The suitability of the site for implementation of Low Impact Development (LID) practices to manage stormwater runoff have been assessed as part of this design process.

2. Background

The site is located at 100 Portsmouth Avenue in Kingston. The focus of the parking lot expansion is to increase the size of the main parking lot, located on the north side of the site. A minimum of additional parking spaces is required.

This site displays potential for having shallow depths to bedrock across the site. Exposed bedrock has been observed at surface on the east side of the site. On the western site limits, shallow bedrock has been observed in excavation during other site work.

3. Sustainability

As part of the design of the parking lot expansion, St. Lawrence College has requested that sustainable designs be considered. The practicality of implementation of LID measures is constrained by the characteristics of the site, including factors such as: soil characteristics, existing drainage patterns, and depth to bedrock. Shallow bed rock reduces the potential for runoff infiltration, the means by which most LID methods function. Therefore, non-infiltration LID practices should be considered for these conditions. The methods outlined below were considered for this site.

3.1. Permeable Pavement

Permeable pavement includes pavers, permeable asphalt, and permeable concrete. Permeable pavements allow runoff to filter through the porous surface into an underlying clearstone reservoir. An advantage of permeable pavement is the capacity to combine infiltration and detention, reducing the need for additional detention requirements. However, it can be assumed based on observed site conditions that bedrock is very close to the surface, and an underdrain would be required to maintain proper function. The Low Impact Development Planning and Design Guide (TRCA) does not recommend installing permeable pavement in areas where bedrock is located within 1.0m of the ground surface. It is also not recommended to have permeable pavement abutting impermeable pavement, as the sediment runoff from impervious areas can clog the permeable asphalt. For any of the proposed configurations that consist of constructing new parking adjacent to the old impermeable asphalt parking lot, this method would not be the most effective to implement at this site. The effectiveness of permeable pavement as a LID practice on this site would be greatly diminished by the lack of runoff infiltration.

3.2. Bioretention

Bioremediation practices are designed to provide both quantity and quality control. Stormwater runoff benefits of these practices include Infiltration and partial recharge. It is recommended that there be 1m separation between the bottom of the practice and bedrock. Since the bedrock on site is presumed to be shallow, it is unlikely that this separation can be achieved. This significantly reduces the practices potential for infiltration and reduces its effectiveness as a LID measure. As these practices are designed to provide quantity control in addition to quality control, a greater depth of material is required than a management practice that provides only quality control. This would result in greater excavation requirements to implement the practices. As infiltration is poor on this site, a minimal amount of runoff would actually infiltrate from this practice. The majority of the runoff would leave the LID practice via underdrain, which would have to be connected to the existing storm sewer

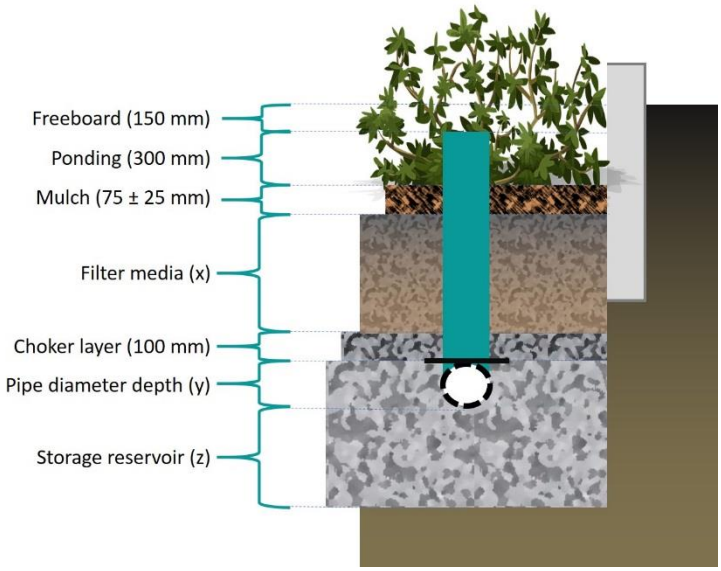

Figure 1: Sample bioswale cross section from "Bioswales: LID SWM Planning and Design Guide"

3.3. Stormwater Planters

Stormwater planters are frequently used in areas where infiltration is not viable due to contaminated soils or shallow bedrock. These planters typically consist of a planting bed of storage media, vegetation, decorative stone or mulch, and an underdrain. A minimum thickness of 600mm of filter media is required to support flower perennials and decorative grasses. Trees require a minimum of 1m of filter media. The purpose of these LID practices us to provide quality treatment, not storage. The only storage provided is that of the water retention capacity of the filter media. The underdrain in the stormwater planters would tie directly into the existing storm infrastructure on site.

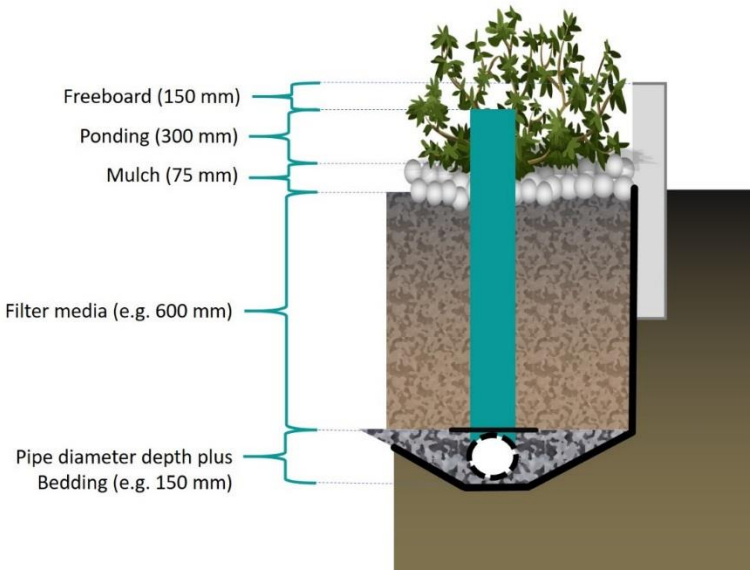

Figure 2: Sample stormwater planter cross section from "Raingardens: LID SWM Planning and Design Guide"

4. Recommendations

Due to the constraints of shallow bedrock on site, the most effective LID measure for this site would be to construct stormwater planters and tie into the existing storm sewer infrastructure. This would provide onsite treatment for runoff. The planters can be constructed internally to the parking lot as curb-less islands or can be located along the edges of the asphalt areas.