6.0 INTEGRATING POST CONSTRUCTION REQUIREMENTS DURING CONSTRUCTION

6.1 Low Impact Development Principles

Low impact development, LID, is a site development management practice approach to managing storm water, addressing water where it falls: infiltrating it, preserving natural drainage patterns, and natural vegetation. These practices offer an opportunity to protect nearby streams, rivers, lakes, and wetlands. Practices, such as infiltration/bioretention basins and vegetated swales, are designed to mimic the predevelopment hydrological conditions through runoff volume control, maintaining base flows, peak runoff rate and water quality control. LID measures can result in less disturbance of the development area, conservation of natural features and can be less cost intensive than traditional control mechanisms. Cost savings are not only for construction but also for long term post construction maintenance and life cycle cost consideration.

Ten common LID practices

1. Rain Gardens and Bioretention
2. Infiltration trenches
3. Created wetlands
4. Vegetated Swales
5. Roof Drain Disconnection
6. Permeable Pavers
7. Soil Amendments
8. Sand filters

6.2 How to manage construction without impacting your post construction practices

Installing LID Management Practices such as bioretention areas and infiltration swales, prior to construction site stabilization, may result in failure of the measures due to sedimentation and/or compaction. Timing their installation (pre-planning) is important to protecting these practices and avoiding sometimes extensive post-construction rehabilitation or complete re-installation. Infiltration practices depend on quality of soils and their porosity. These practices depend on soil mixtures, types, and pH. A standard functional bioretention facility should have sand, loam and compost mixture. No other materials or substance should be mixed in it that may be harmful to plant growth or prove a hindrance to planting or maintenance to operations. The planting soil must be free of plant or seed material of non-native invasive species or noxious weeds. Sediment run-on from disturbed areas can clog practices and change the soils composition and pH. Also, compaction due to construction disturbance can also impact their effectiveness and result in the necessity of spending more resources to restore their functionality.

Construction Staging

To ensure the greatest potential of success of a LID facility, practices should not be installed until construction activity is completed and stabilized within the entire contributing drainage area; this means having all areas both fully landscaped and mulched or having well established grass or other ground cover. Construction drawings should clearly state the designer's intentions and an appropriate stage of construction should be shown on the plans. This staging should be covered in detail at the pre-construction meeting (including the on-site responsible construction personnel) and then enforced by an appropriate inspection program throughout the construction period. On-site education of contractor and/or subcontractors would also be advised. Storing and reestablishing top soil on site is important to reestablishing the overall infiltration of the site.

Each site is unique, and this strict construction staging approach may not be necessary, such as in the case of bioretention in parking lot islands with little contributing pervious areas. It is critical that the designer understands these realities and plans accordingly.

Erosion prevention and sediment controls

Erosion prevention and sediment control plans (EPSC) should be developed at the same time as the permanent stormwater management plan concept with an eye for potential hot spots; these potential trouble areas should have redundant practices installed in an effort to protect the LID facility from unusually extreme or long duration storm events that could inundate the protection. An enforceable inspection program is a critical component of this approach as well. In the event that a breach of the protection practices occurs that results in adverse impact of the facility, mandatory reconstruction of the facility should be enforceable, if needed.

Site control practices are grouped into two categories: temporary practices during construction and permanent practices for permanent stormwater management runoff control. Practices that are installed for the construction phase that are meant to persist and become post-construction management practices such as sediment basins and vegetative swales depend on specific design parameters such as:

- Soil type, pH, and permeability
- Practice volume and freeboard
- Infiltration
- Open space

Temporary Flow Control

If the decision is made to construct a LID facility, such as a retention/infiltration area or constructed wetland, in conjunction with the overall site the drainage from up-gradient disturbed areas should be diverted around the facility. The diversion must remain in place until all disturbed areas contributing to the facility are stabilized. The diversion must employ sediment control devices such as earth dikes, diversion swales, etc. as soon as possible before construction begins. Depending on the soil type, the diversion channel may require some type of surface protection to prevent erosion of the channel surface. Diversion channels must be designed with a cross section sufficiently large to carry the required design storm. Even in this case, sequencing should be established to delay the facilities' construction as long as possible and timed to minimize the potential of sedimentation.

Permanent Control

Detention and sediment ponds installed initially during construction and to be used for post-construction management as well. In those instances, the ponds must be cleaned out with pertinent elevations and storage and treatment capacities reestablished as noted in the approved storm water management plan. The final as-built certification must verify that final elevations and volumes are established per plans. The principal and emergency spillways should also be verified to meet permanent stormwater management plan parameters. Reduction of erosion and sediment draining to them can reduce the time and effort to maintain these practices and establish their post-construction functions. Many municipalities will not release construction bonds without approved as-builts.

Undisturbed Areas

Open space/undisturbed areas which have been set aside for post construction amenities should be identified on the plans, fenced off from any construction traffic, protected from sedimentation run-on and addressed specifically in pre-construction meetings. Disturbance and compaction of these areas can impact their functions and can result in costly rehabilitation and potential notice of violation and penalties. Extensive disturbance and compaction of these areas could result in redesign of site and of the storm water treatment train. Again continuous education of contractors and subcontractors by the permit holder or the inspector is vital.

Minimize impact area

Minimize the adverse impacts of the development on water quality and the hydrologic site conditions by avoiding construction or land disturbance in the most sensitive areas. These would include steep slopes, wooded areas, erodible soils, natural drainage ways, and stream buffers to name a few. These areas should be clearly delineated on the plan sheets and in the field and contractors and subcontractors should be educated on avoidance of these areas. By realizing that site development is a dynamic process, the site designer is challenged to choose an erosion sediment and management strategy that will accommodate the changing landscape of the site during phases of construction.