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Sustainable Technologies
EVALUATION PROGRAM

New Erosion and Sediment Control Guidance for the Greater Golden Horseshoe Area

Presented by: Lisa Rocha

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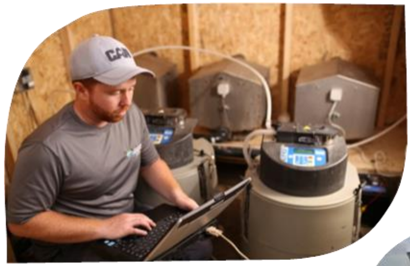
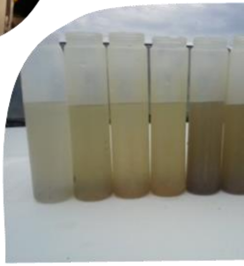




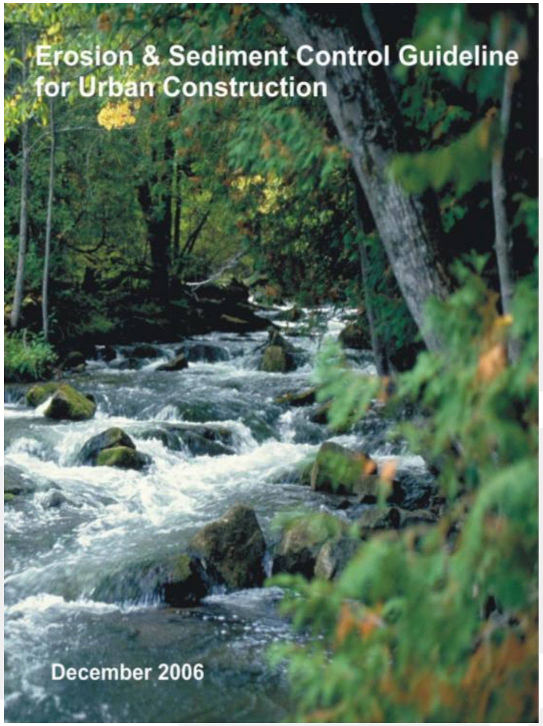
The water component of STEP is a partnership between:

Toronto and Region Conservation for The Living City

Credit Valley Conservation inspired by nature

Lake Simcoe Region conservation authority

ESC Guideline Update



Why is the update needed?

- *GGHA Conservation Authorities ESC Guideline for Urban Construction* published over 10 years ago
- ESC knowledge has expanded & practice has evolved
- Key changes this past decade:
  - Availability of professional training
  - Legislative changes
  - Changes to BMPs
  - Expanded knowledge and understanding of key ESC issues
  - Turbidity monitoring requirements for SAR habitat (e.g. Silt Smart Protocol)

Guide Contributors

- Authors:
  - TRCA and CVC staff in planning ecology, water resources engineering, STEP, and restoration services.

- External advisory group including representatives from:
  - Provincial ministries (MOECC, MNRF, MTO)
  - Environment Canada
  - Municipalities
  - Construction and development industry (i.e. consultants, developers, contractors)
  - Ten conservation authorities in southern Ontario (TRCA, CVC, GRCA, LSRCA, CLOCA, UTCA, RVCA, HRCA, HCA, NVCA)

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Highlights

- Qualitative erosion risk assessment methodology
- Updated information on protecting natural features during in-water works
- Guidance on ESC effectiveness and turbidity monitoring
- Recommendations for protecting LID features during construction
- Clarification of approvals process, including flowcharts
- Inclusion of new BMPs and adoption of generic BMP names

Primary Sources

- Guide draws on information from several key locally applicable guidelines, standards and policies
- Additional sources:
  - Federal and provincial legislation
  - Research papers and studies
  - ESC guidance from other jurisdictions in Canada and the U.S.

Erosion Risk Assessment

- New addition to the guide
- Derived from MTO's risk assessment methodology outlined in *Environmental Guide for ESC During Construction of Highway Projects (2015) and RUSLE For Application in Canada (2002).*

- Part of preliminary site assessment – done prior to the start of construction

Erosion Risk Assessment

- Qualitative assessment of erosion risk based on the following factors:
  - Soil Characteristics
  - Topography
  - Rainfall and Climate Variations
  - Soil Cover
  - Duration and Extent of Disturbance
- Larger development sites divided into polygons of like erosion potential
- Erosion risk assessment is carried out for each polygon
- Outcome of erosion risk assessment informs decisions about appropriate BMP selection

Erosion Risk Assessment

- **STEP 1:** Collect site information
  - Data related to erosion risk (e.g. soil type, slopes)
  - Requires onsite investigation and desktop analysis
- **STEP 2:** Divide site into polygons larger sites)
  - Areas of like erosion risk
  - Based on site data collected and use of GIS
  - See MTO guideline for examples
- **STEP 3:** Rate erosion risk for all factors
  - Use tables provided to classify erosion risk as low, moderate or high
  - Repeat for each polygon

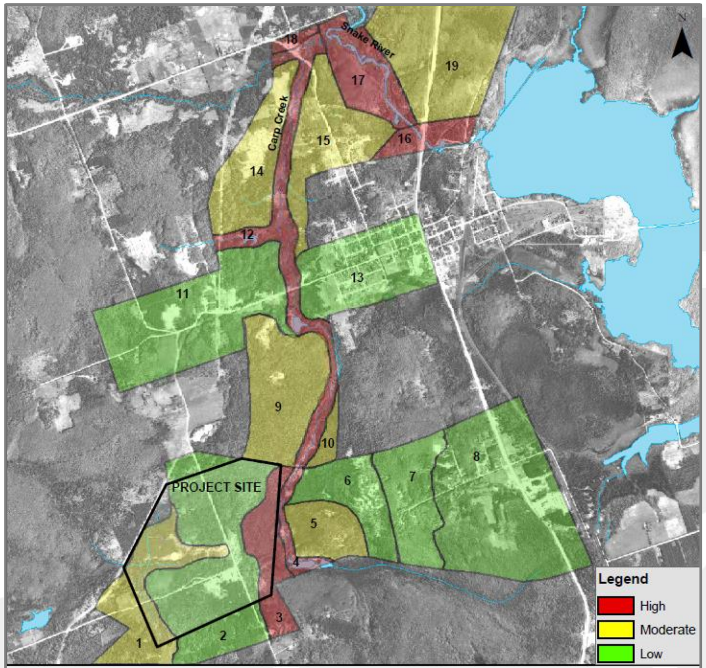

Photo credit: MTO's *Environmental Guide for ESC during the Construction of Hwy Projects (2015)*

Erosion Risk Assessment

Soil Characteristics

Soil Type	Erodibility Classification	Soil Erodibility Rating
Well Graded Gravel	Least	Low
Poorly Graded Gravel		Low
Sand		Low
Loamy Sand		Low
Heavy Clay		Low
Clay		Low
Silty Clay		Low
Silty Clay		Moderate
Sandy Clay Loam		Moderate
Silty Clay Loam		Moderate
Sandy Loam		Moderate
Silty Sand		High
Loam		High
Silt Loam		High
Silt	Most	High

Erosion Risk Assessment

Topography

Slope gradient	Soil erodibility	Erosion Potential	
		slope length <30 m	slope length >30m
<2%	Low	Low	Moderate
	Moderate	Moderate	Moderate
	High	Moderate	High
2-10 %	Low	Low	Moderate
	Moderate	Moderate	High
	High	High	High
>10%	Low	Low	Moderate
	Moderate	High	High
	High	High	High

Erosion Risk Assessment

Soil Cover

Cover Management	Erodibility Classification	Soil Erodibility Rating
Densely vegetated areas	Least	Low
Sodded/Established Vegetated Areas		Low
Soil Sealant and Rolled Erosion Controls		Moderate to Low
Hydroseeded/Hydromulch Areas Prior to Significant Vegetation Growth		Moderate to Low
Established temporary crop covered/vegetated lands		Moderate
Seeded lands prior to significant vegetation growth		High
Sparsely vegetated lands		High
Bare lands (exposed soil) following topsoil stripping and/or grading	Most	High

Erosion Risk Assessment

- **STEP 4:** Determine overall erosion risk for each polygon
  - Use table provided to assign values according to the risk level for each factor
  - Total points to determine if erosion risk is low, moderate or high
- **STEP 5:** Apply overall erosion risk assessment to determine best practices
  - Use table provided to consider which structural and non structural best practices are appropriate in each polygon

Erosion Risk Assessment

Overall risk determination (in each polygon)

Erosion Risk Factors	Low	Moderate	High
Soil Characteristics			
Soil Cover			
Extent of Disturbance			
Topography			
Duration of Disturbance			
Rainfall and Climate			

Values weighted based on relative importance of each risk factor

OVERALL EROSION RISK	
Low	
Moderate	
High	

Range of values based on totals above

Applying the erosion risk assessment

Minimum best practices recommended	Low risk	Moderate risk	high risk
Procedural ESC Measures	yes	yes	yes
ESC Plan	yes	yes	yes
Routine inspection of ESC effectiveness	yes	yes	yes
Flow/Runoff Diversion	optional	where possible	yes
Staged Construction and Progressive Rehabilitation	optional	where possible	yes
More intensive ESC measures	optional	optional	Yes
Turbidity monitoring	optional	After significant rainfall/snowmelt	Continuous

The turbidity monitoring spectrum

Method	Location	Advantages
Handheld turbidity measurement of grab samples	Site discharge points	• Straightforward • Low equipment cost • Direct measurement of site runoff = greater accountability • Problem areas can be pinpointed • Can be carried out even in the winter
	Receiving water D/s and U/s of site	• Low equipment cost • More readily comparable to existing CWQG for aquatic life • Can be carried out even in the winter
Continuous online turbidity measurement	Outlet of sediment control pond	• Concentration & duration = more accurate assessment • Convenience - data logged at all times of day and night • Set location means higher precision and comparability
	Receiving water D/s and U/s of site	• Concentration & duration = more accurate assessment • Convenience - data logged at all times of day and night • Set location means higher precision and comparability • Readily comparable to existing CWQG for aquatic life
Continuous online turbidity measurement with remote real-time access to data	Outlet of sediment control pond	In addition to those listed above: • Convenience of remote access • Opportunity for faster problem response
	Receiving water D/s and U/s of site	In addition to those listed above: • Convenience of remote access • Opportunity for faster problem response

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The turbidity monitoring spectrum

Method	Location	Disadvantages
Handheld turbidity measurement of grab samples	Site discharge points	• Staff costs for sampling • Limited to locations where grab sampling is possible • Potential for error due to poor sampling technique • Duration is not assessed
	Receiving water D/s and U/s of site	• Need to determine pre-construction background turbidity • Staff cost for pre-and during construction sampling
Continuous online turbidity measurement	Outlet of sediment control pond	• Higher equipment cost • Staff costs for data QA/QC • Site visits required to retrieve data – delays problem response • Only pond effluent is assessed • Not operational during winter
	Receiving water D/s and U/s of site	• Higher equipment cost • Staff costs for data QA/QC • Site visits required to retrieve data – delays problem response • Need to determine pre-construction background turbidity • Staff cost for pre-and during construction sampling • Not operational during winter
Continuous online turbidity measurement with remote real-time access to data	Outlet of sediment control pond	• Highest equipment cost • Staff costs for data QA/QC • Only pond effluent is assessed • Not operational during winter
	Receiving water D/s and U/s of site	• Highest equipment cost • Staff costs for data QA/QC • Need to determine pre-construction background turbidity • Staff cost for pre-construction sampling • Not operational during winter

Turbidity monitoring in the Silt Smart Protocol

- *Silt Smart - Erosion and Sediment Control Effectiveness Monitoring and Rapid Response Protocol for High Risk Construction Projects*
- Requirement for continuous in-stream turbidity monitoring with remote real-time data access
- Eligible sites are:
  - >25 ha and/or high risk; and
  - Discharging to sensitive streams including those that support species at risk and coldwater species

Turbidity monitoring in the Silt Smart Protocol

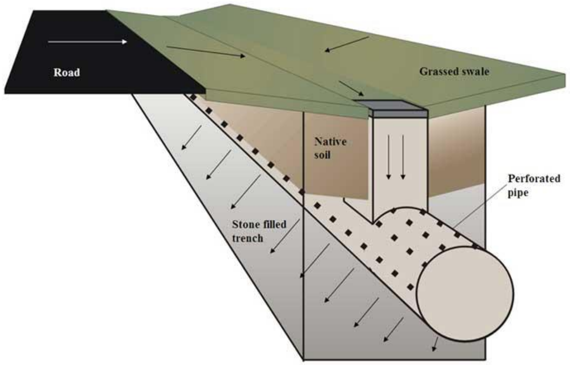
- Trigger levels are determined for each site based on pre-development background turbidity
- The configuration of the equipment allows contact groups to receive alerts when turbidity exceeds triggers.
- Protocol focuses on prevention, encouraging rapid response to ESC deficiencies on high risk projects
- Response and reporting requirements:

Requirement	Details
Problem response	All deficiencies in ESC design and maintenance as identified through inspection will be rectified as soon as possible and not later than 24 hours of notice.
Preliminary assessment report	Required within 10 hours after first light
Final assessment report	Report, stamped by a qualified professional, is required within 48 hours of the end of the occurrence.

Protecting LID during construction

- What types of LID need protection during construction?

Practices applied at or below ground level to infiltrate or filter stormwater



Protecting LID during construction

- Impacts to LID during construction, where inadequate protection is in place:
  - Clogging with sediment
  - Erosion of inlets and beds (for planted areas)
  - Subgrade compaction by heavy machinery
  - Contamination by substances in construction runoff
- Lack of understanding of the system can also result in damage to components
- Protection required until:
  - construction is complete
  - contributing drainage area is stabilized
  - construction vehicle mud tracking has ceased

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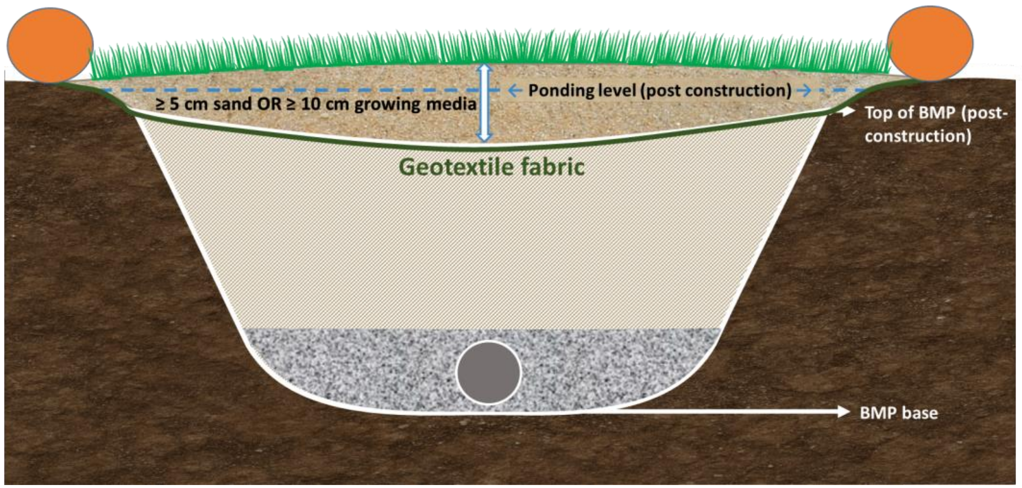
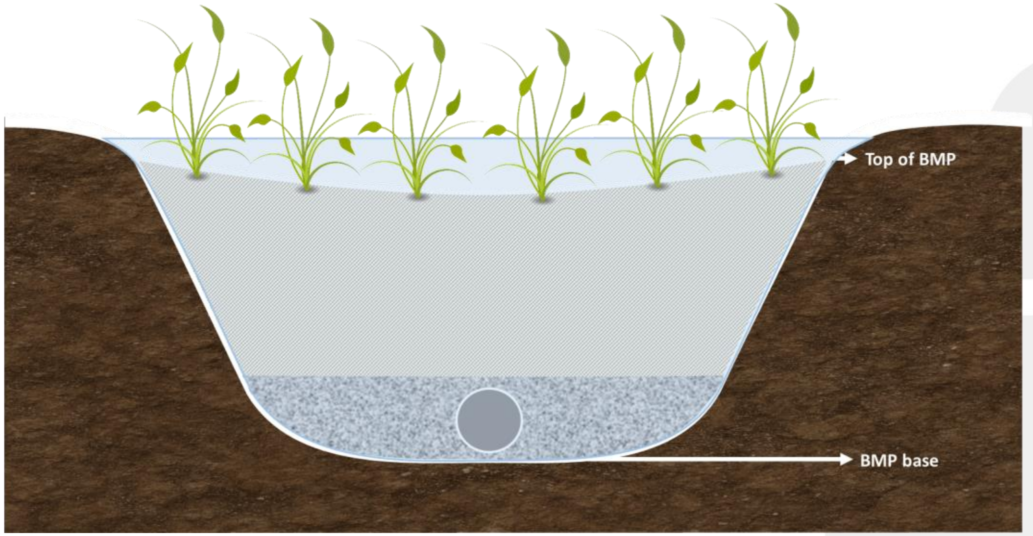
Protecting LID during construction

- Diverting flows around LID areas provides best protection
- Benefits:
  - Less erosion risk, clogging
  - Opportunity for seeded/planted LID areas to become established
  - Easier access to carry out additional construction, repairs or maintenance of the LID area

Protecting surface infiltration LIDs

When flows can be diverted

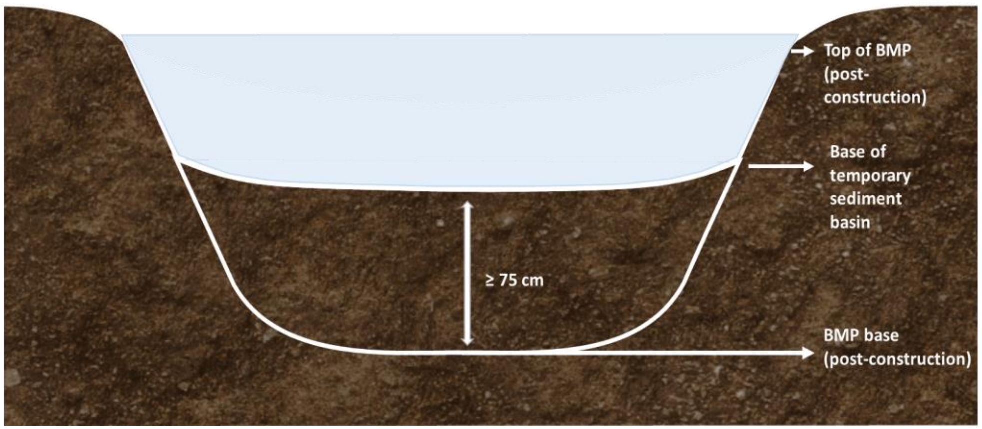


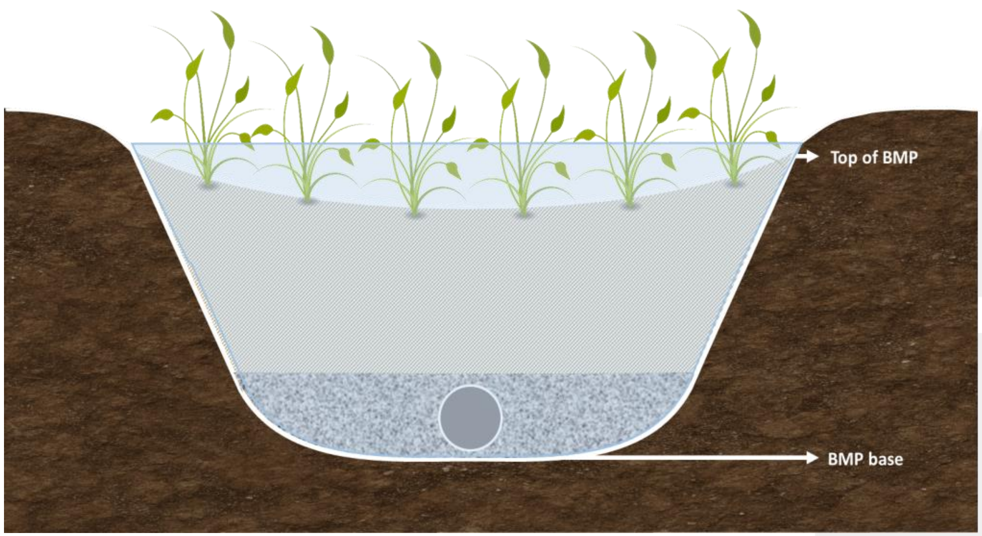


- LID is built but not planted
- A layer of growing media (≥10 cm) or sand (≥5 cm) and geotextile is added on top of the final post construction grade of the BMP
- This sacrificial protective layer is removed once construction is complete and BMP starts receiving flow
- Enhanced protection - compost biofilter socks surrounding the area and stabilization of the sand/growing media

Protecting surface infiltration LIDs

When LID area serves as temporary detention basin

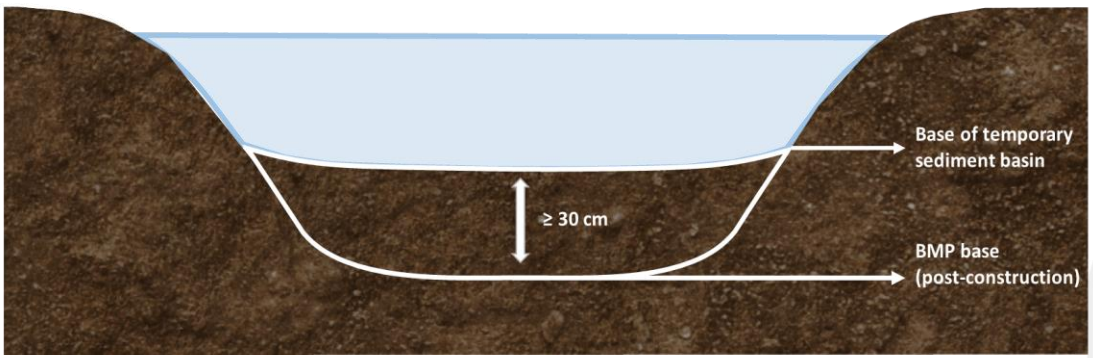


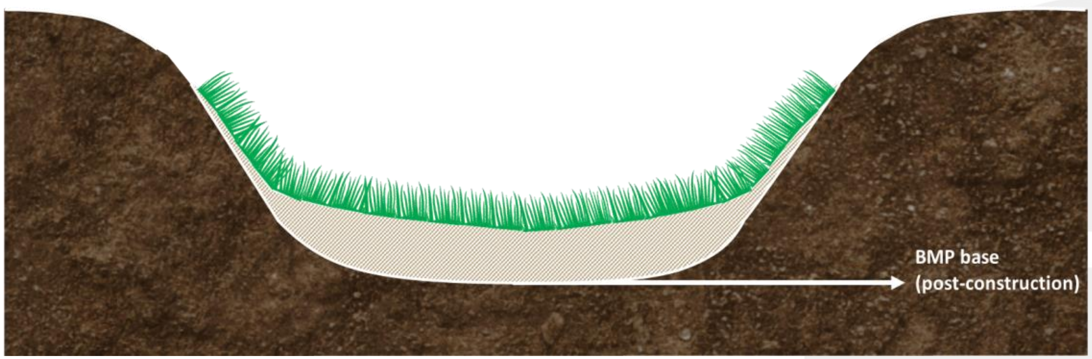


- When flows cannot be routed around LID during construction
- Bioretention example shown
- Retain ≥75 cm native soil between the base of the detention basin and the final base of the LID when complete.
- Sediment accumulation in detention basin removed during excavation to construct LID.
- Once LID is built, protect until construction and stabilization are complete.

Protecting surface filtration LIDs

When LID area serves as temporary detention basin

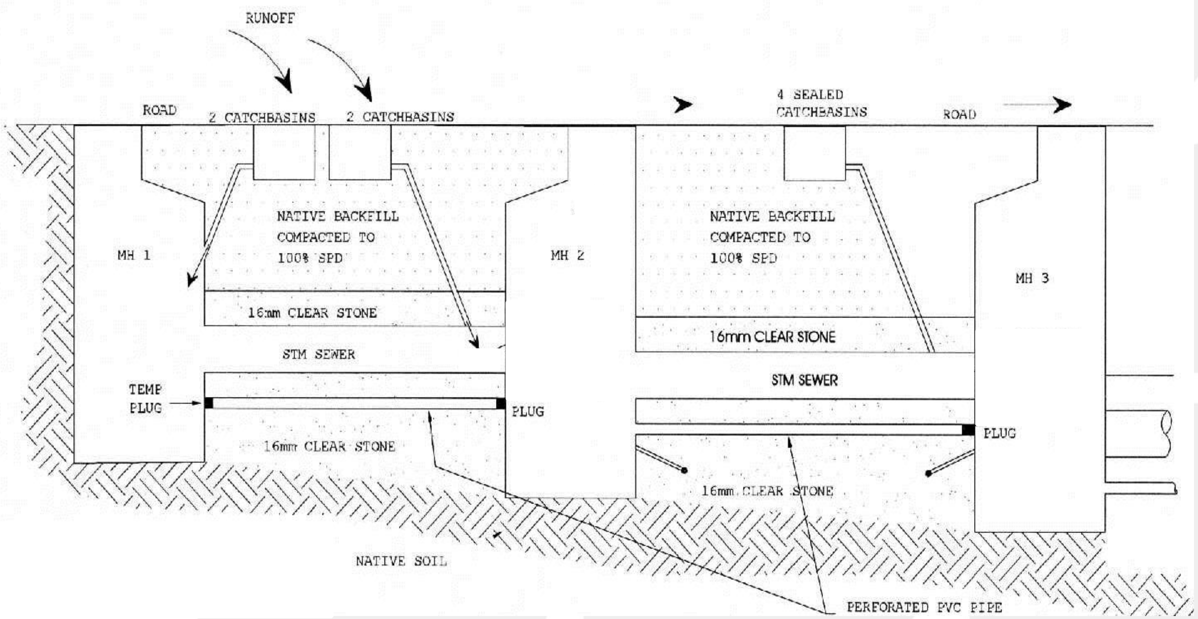




- When flows cannot be routed around LID during construction
- Grass swale example shown
- Retain ≥30 cm native soil between the base of the detention basin and the final base of the LID when complete.
- Once LID is built, protect until construction and stabilization are complete.

Protecting LID during construction

- LID installations that are below ground (e.g. infiltration chambers), can be constructed early (e.g. during cut/fill)
- Barrier (e.g. plug, bulkhead) must be installed during construction to prevent facility clogging
- Facility only begins to receive runoff when construction is complete, drainage area stabilized, vehicle mud tracking has ceased.



Protecting LID during construction

General guidance

- Ensure LID areas are properly identified and sectioned off, and that staff are aware of best practices
- Maintain LID perimeter controls throughout construction
- Avoid heavy equipment on intended infiltration sites to avoid native soil compaction
- Regular ESC site inspections to include LID areas
- For detailed guidance → CVC's *LID Construction Guide* (2012) and full day course (www.sustainabletechnnologies.ca/events)

THANK YOU!

Have any burning questions? Want to get involved?

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Project updates and information on other STEP ESC research and training:

www.sustainabletechnologies.ca

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