CVCA - LID Infrastructure Performance and Risk Assessment (IPRA) program

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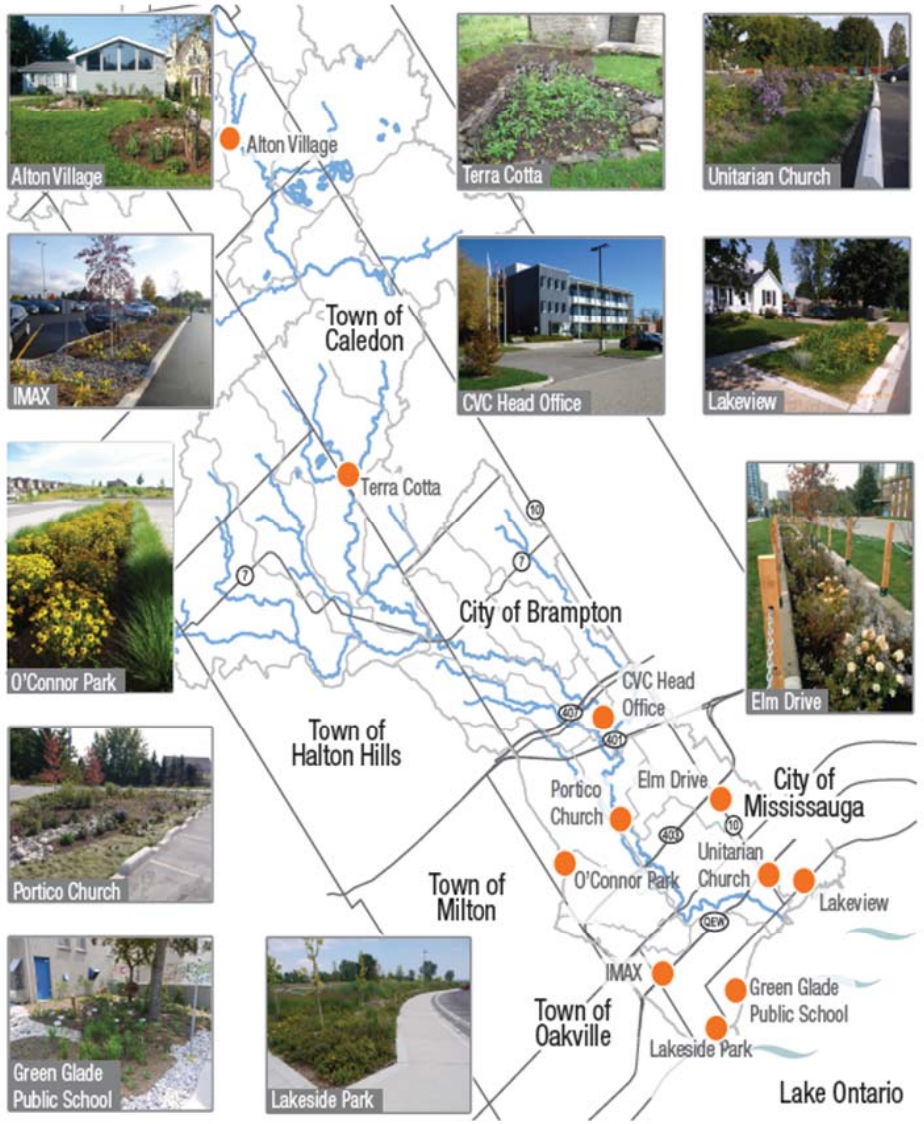
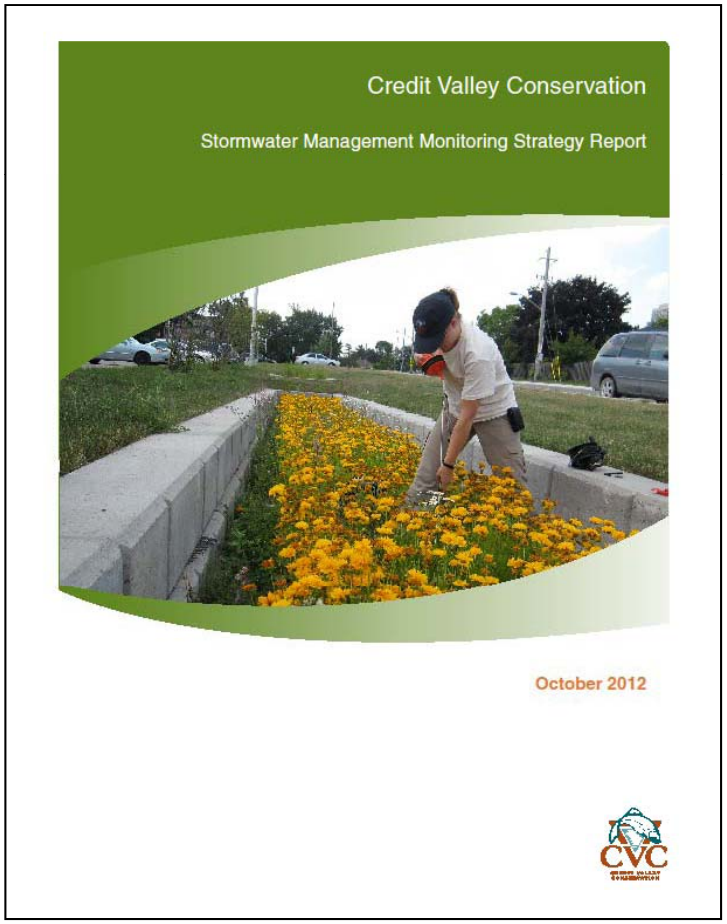
CVC Infrastructure Performance Monitoring Program

- 61 LID Sites
- 12 Demonstration Sites
  - Road Right of Ways
  - Residential sites
  - Public Land sites
  - industrial/commercial



Stormwater Management Monitoring Strategy



• Highlight the importance of SWM monitoring in the design, construction, assumption, operation and maintenance of stormwater infrastructure to ensure long-term performance;

• Provide an overview of how CVC's stormwater monitoring program fits within our watershed stakeholders priorities (Region of Peel and member municipalities, Ministry of Environment, Ministry of Natural Resources, Development Community);

• **Defined 18 objectives for CVC's overall SWM monitoring program**.

Top Five Performance Monitoring Priorities

- Water quality and quantity performance of LID design in low infiltration soils;
- How multiple LID treats and manages stormwater;
- Performance of flood control, erosion control, water quality and natural heritage protection.
- Long term maintenance needs and impact on performance;
- Lifecycle costs (asset management);

Importance of Performance Monitoring

- Provide information on LID performance
- Meet compliance requirements
- Inform design standards
- Inform municipal resolutions for LID implementation
- Provide solutions and procedures for maintenance
- Inform life-cycle costing

Monitoring LID: Why?

Compliance Monitoring

- Environmental Compliance Approval (MOECC's requirement)
- SWM design standards

Performance Monitoring

- To feed into future designs based off performance of existing sites

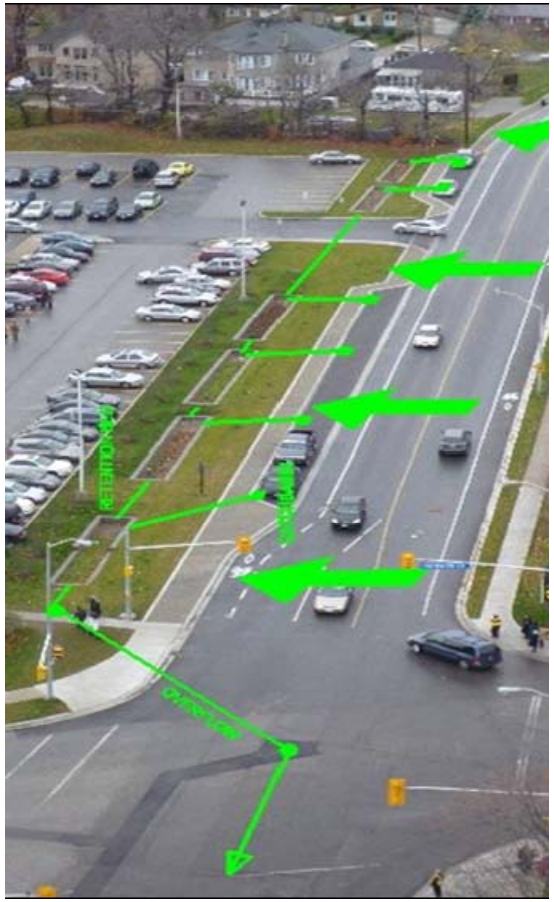
Monitoring LID: Why?

Adaptive Monitoring

- Adapt to new questions, requirements and designs
- New needs with changing climate
- Develop new criteria and changes to current standards; demonstrate duty of care of our infrastructure

Assumption Monitoring

- Monitoring to ensure site functionality prior to assumption

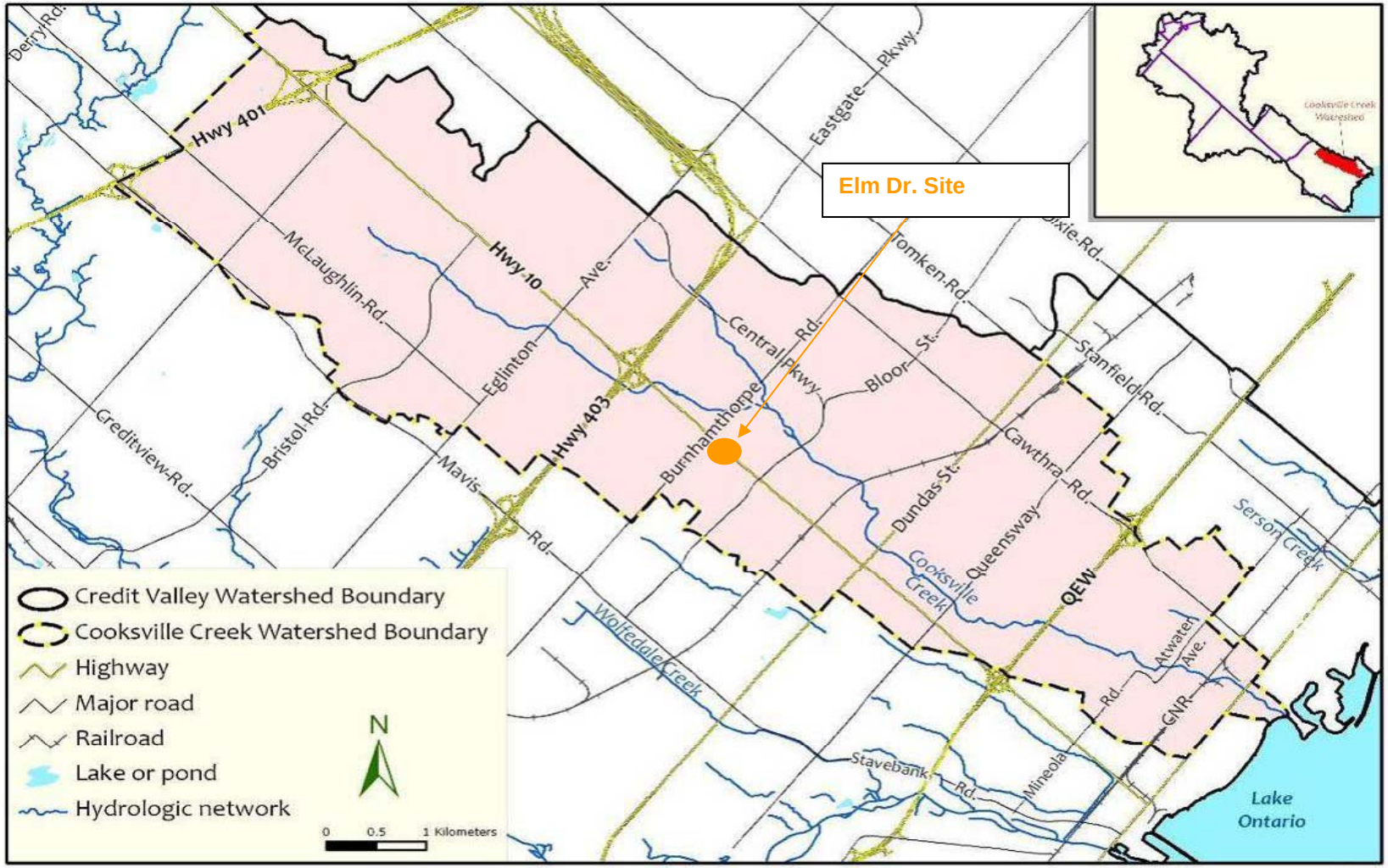


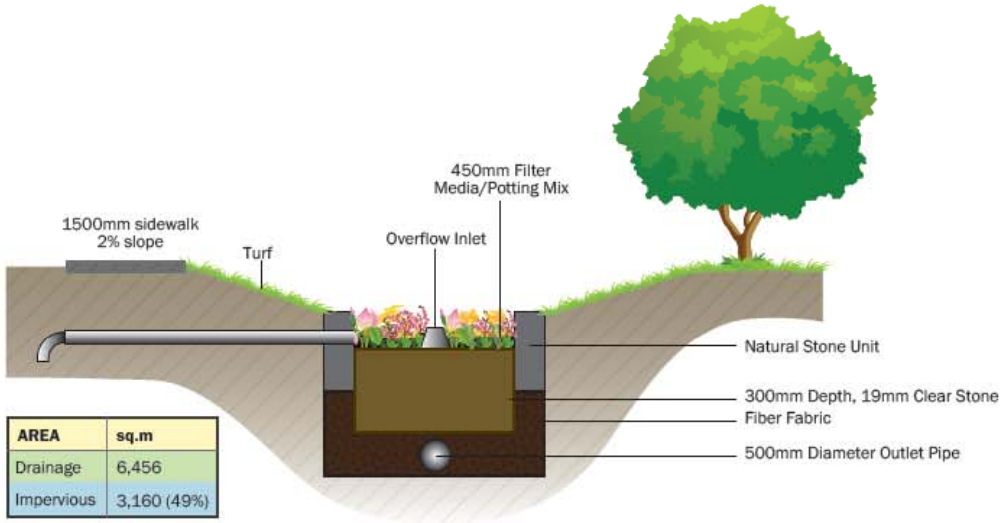
Elm Elm Drive – Demonstration Site

Credit Valley Conservation

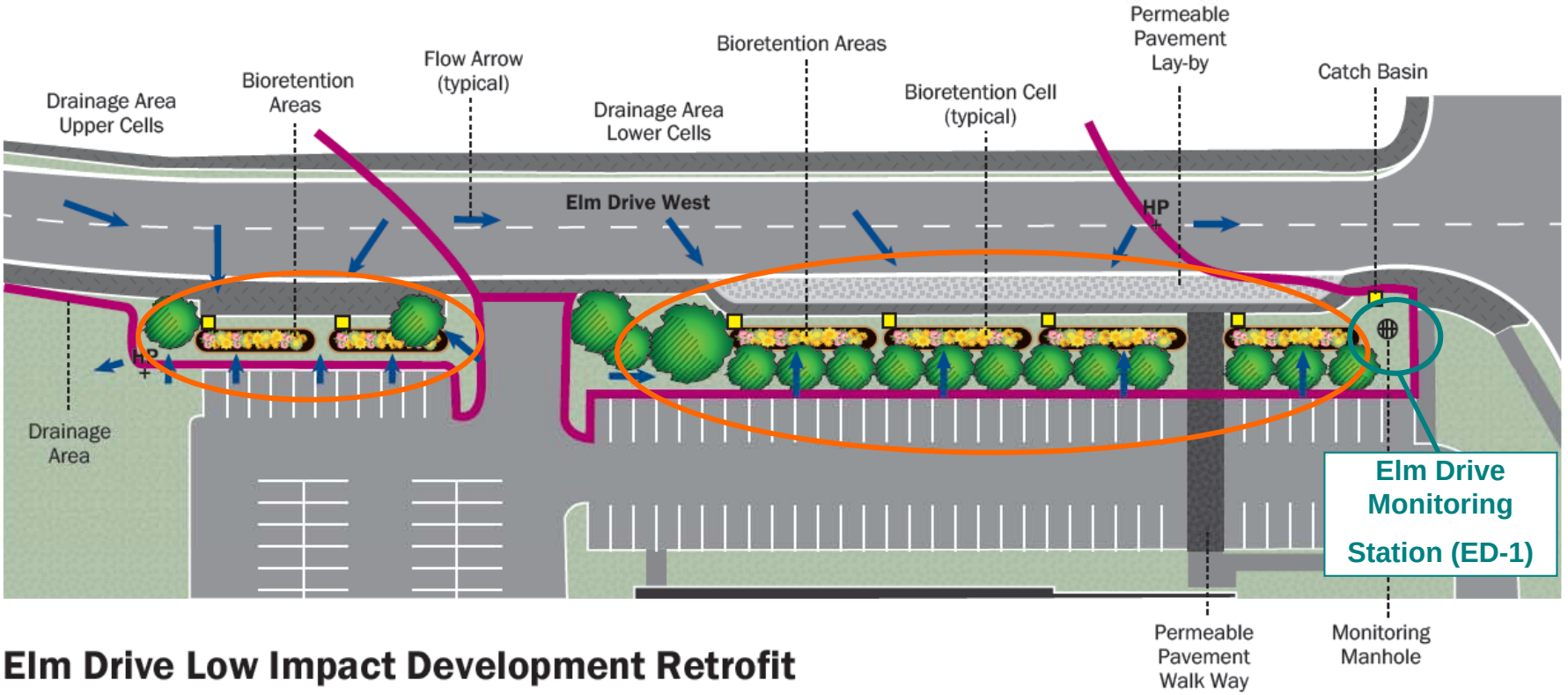
Credit Valley Conservation

Elm Drive: Demonstration Site





AREA	sq.m
Drainage	6,456
Impervious	3,160 (49%)



Elm Drive Low Impact Development Retrofit

Demonstration Site Implementation

- Ward councillor and School Board Trustee provided direction from top down;
- Key project partners included:
  - the City of Mississauga Transportation & Works Department
  - School principal
  - PDSB Maintenance Manager
  - CVC staff

Integration between Departments

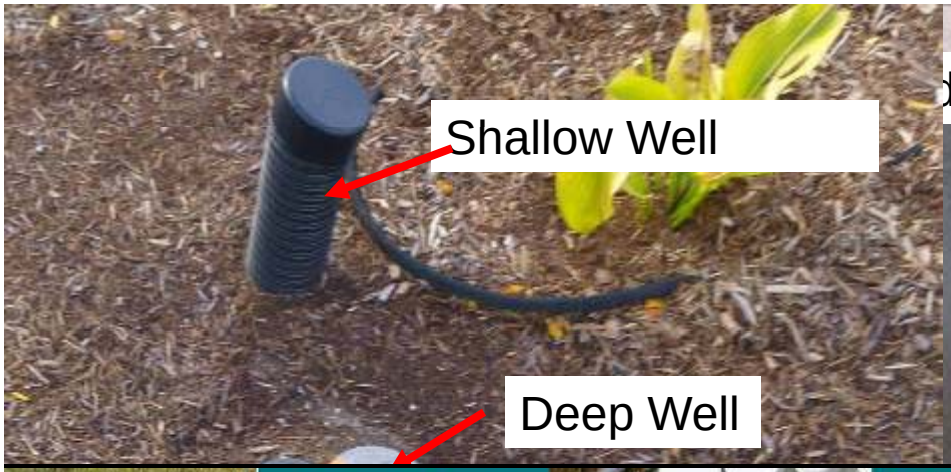
- Within the City of Mississauga all departments were engaged to ensure integration;

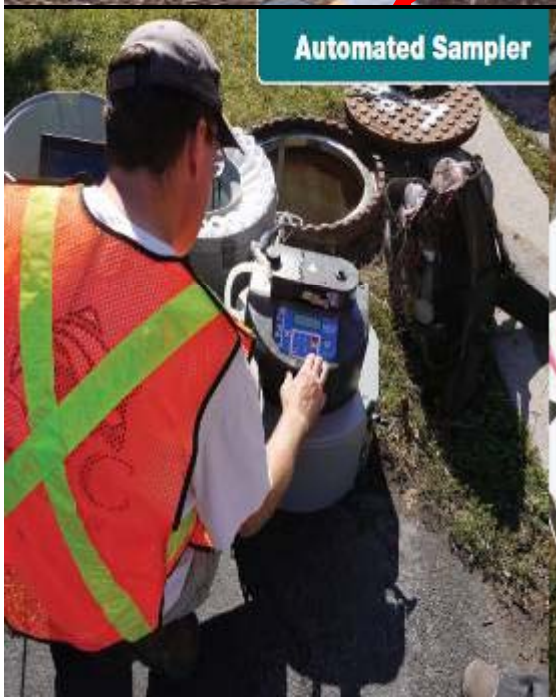
- Ensured that the people responsible for planning, constructing and maintenance are all involved in the process from the beginning.

Maintenance Responsibilities

- School Board and City agreed to terms for granting the city the use of school board property for SWM purposes;
- The right for the city to enter the school board property for construction and maintenance of the LID practices;
- The city assumed responsibility for the bioretention planters.

Monitoring Data Collection





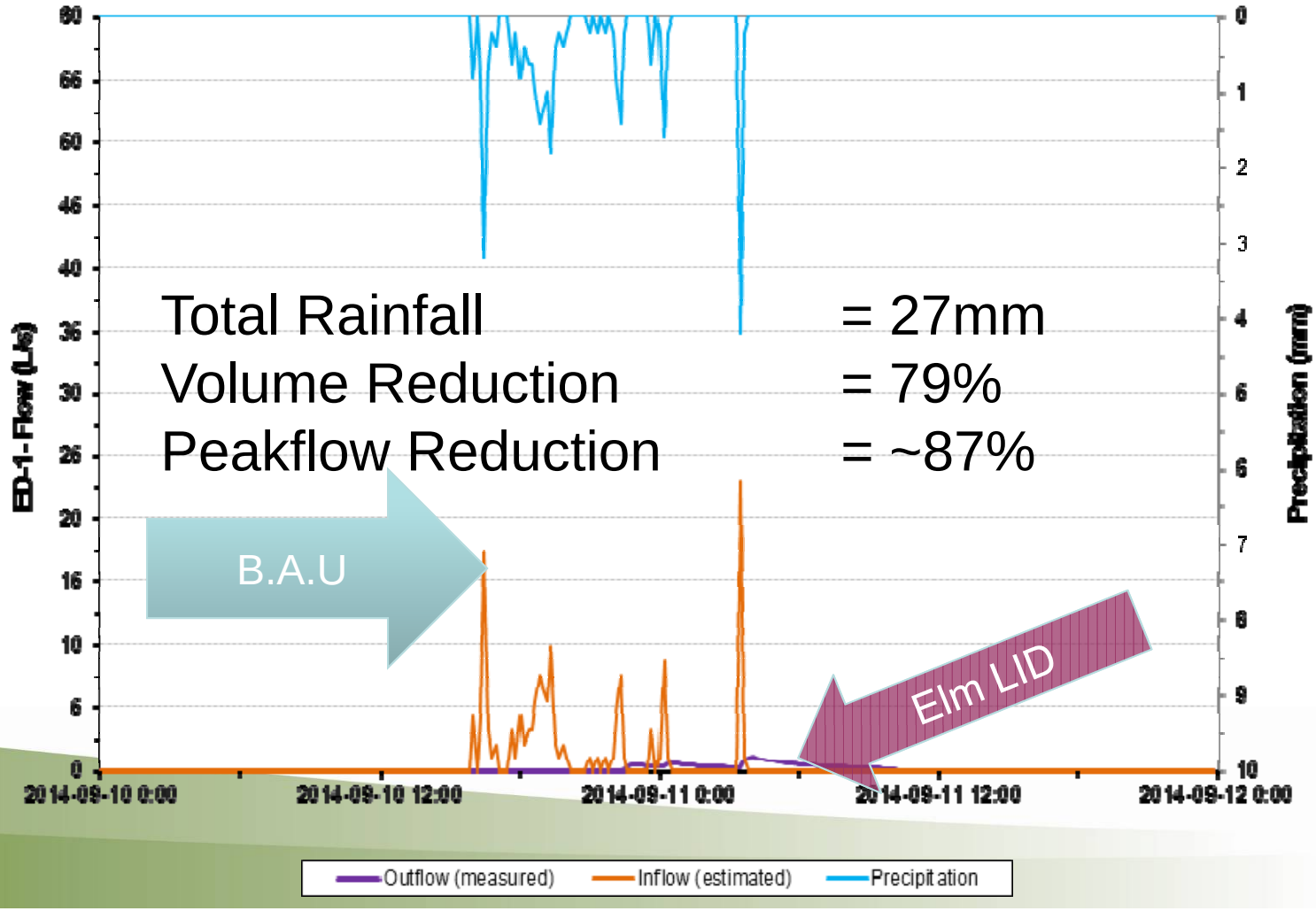
- Precipitation: Heated rain gauge
- Outflows: V-notch weirs
- Water levels: observational wells
- Water Quality
  - flow-proportioned composite samples
  - 15 events/year
  - general chemistry, TSS, nutrients, metals, temperature

Qualitative Observation:

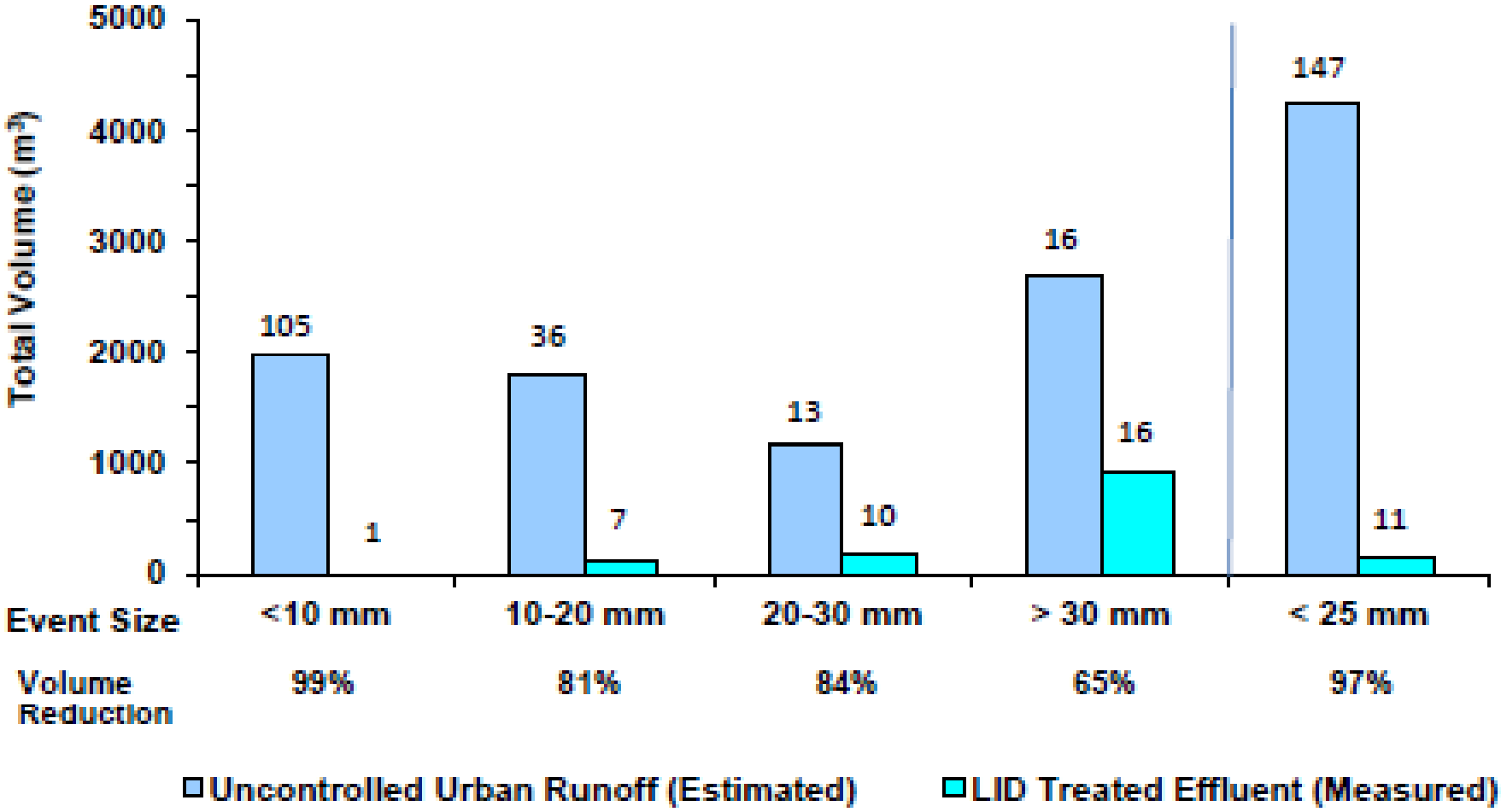
- Observing a site during precipitation events is critical to identifying how the site is functioning/performing
- These observations can assist in the interpretation of monitoring data, and add to the overall information record of a site

Lesson Learned : *Observing precipitation events can provide insight into the functionality of the site that may not become apparent even with detailed monitoring.*

Inflow and Outflow Hydrographs



Volume Reduction



Water Quality Performance

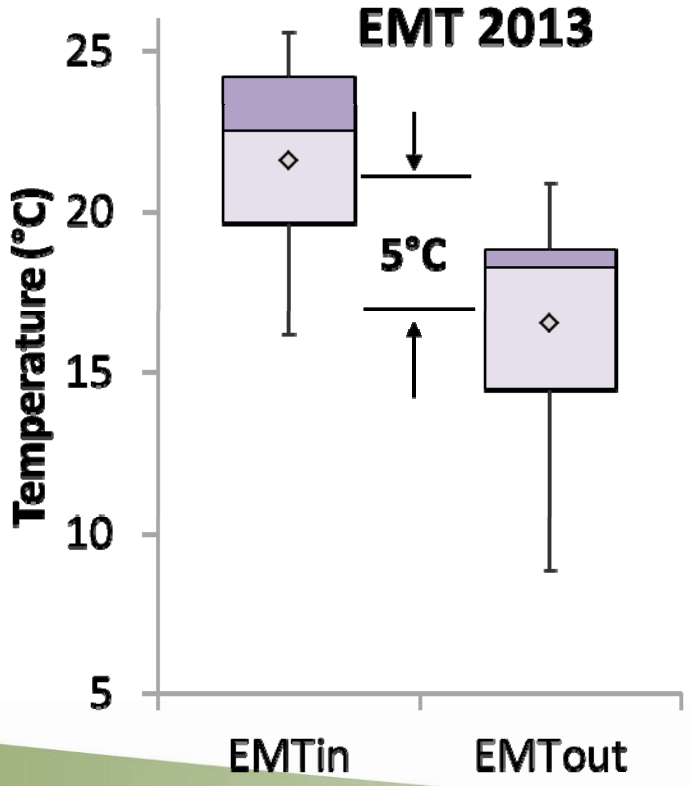
Parameter	Total Estimated Influent Load (g)	Total Estimated Effluent Load (g)	Estimated Load Reduction (%)
NO_3	5,255	1,386	74%
OP	976	44	95%
Cd	0.21	0.11	48%
Cu	83	7	92%
Fe	11,823	353	97%
TKN	9,683	762	92%
Pb	39	2.2	94%
Ni	22	0.9	96%
TP	2,027	76	96%
TSS	457,899	30,235	93%
Zn	548	18	97%

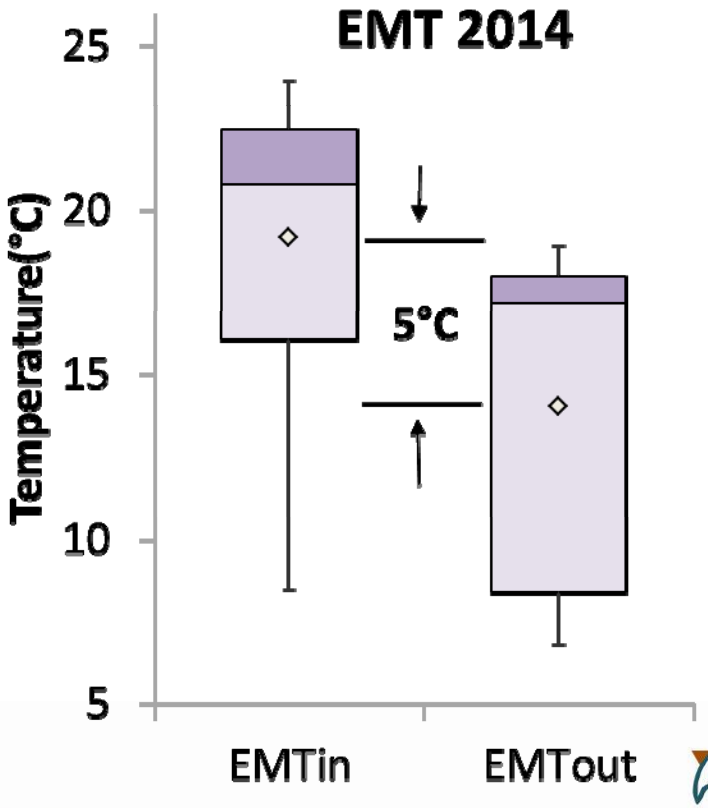
Water Quality and Treatment Train Performance in Low Infiltration Soils

- 90% of all rainfall events are filtered by LID
- 69% of all rainfall is detained and infiltrated
- Only 3-8 rainfall events produce runoff where 93% of Total Suspended Solids and 96% Total Phosphorus is removed

Before After

Temperature Performance





EMT = Event Mean Concentration

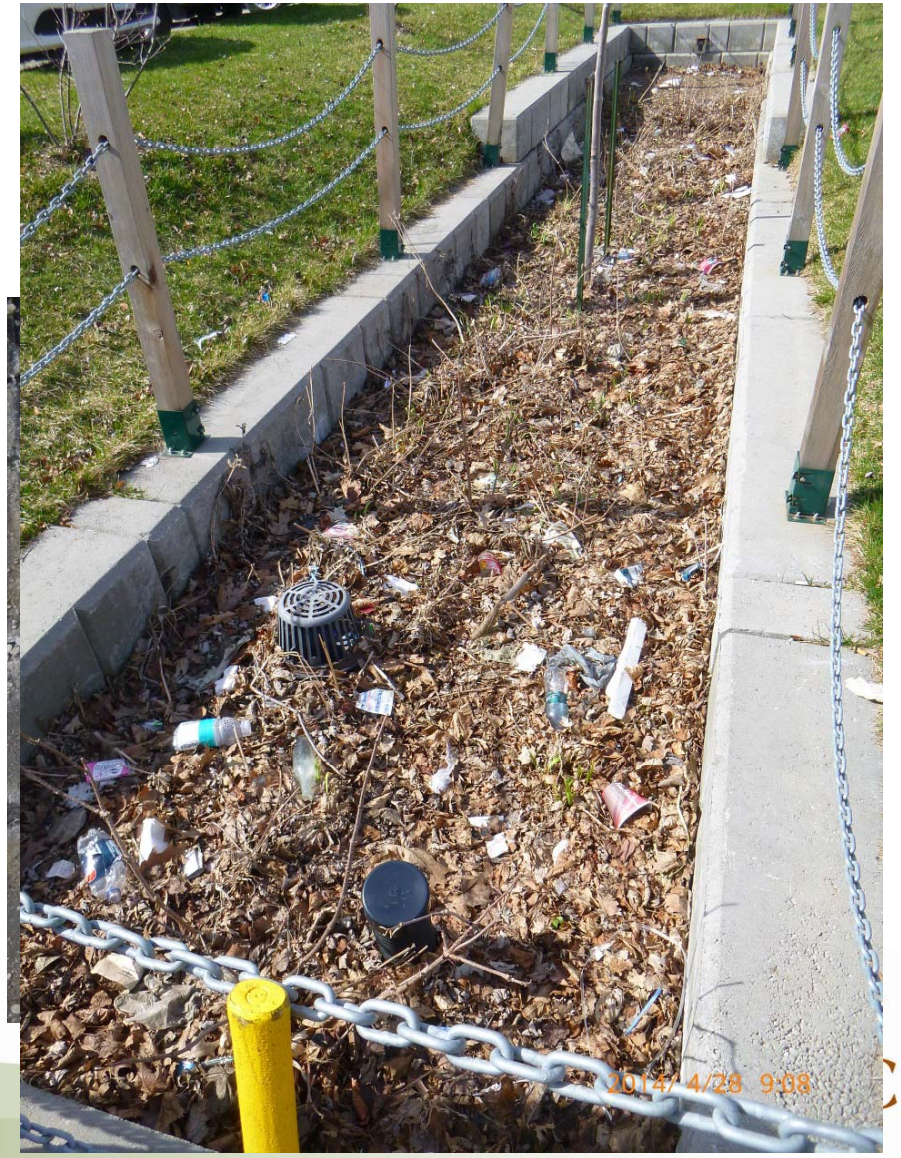
Operational Level of Service

Metric	Criteria	Performance at Elm	Criteria Met?
Peak Flow Reduction	100-Year Post equal to Pre	60% Reduction	N/A
Runoff Volume Reduction	15 mm	21 mm	
TSS Removal	80%	93%	
Phosphorous Removal	80%	96%	
Effluent Cd Concentration	0.2 µg/L	0.10	
Effluent Ni Concentration	25 µg/L	0.70	

Operation & Maintenance

Issues & Challenges

- Excess salt clogging permeable pavement
- Garbage and debris collecting in bioretention cells



Issues & Challenges

Credit Valley Conservation

TRCA Inspection & Maintenance Guide

LOW IMPACT DEVELOPMENT
STORMWATER PRACTICE
INSPECTION AND MAINTENANCE GUIDE

DRAFT
JUNE 2015

Toronto and Region Conservation for The Living City

Sustainable Technologies Evaluation Program

O&M Design Considerations

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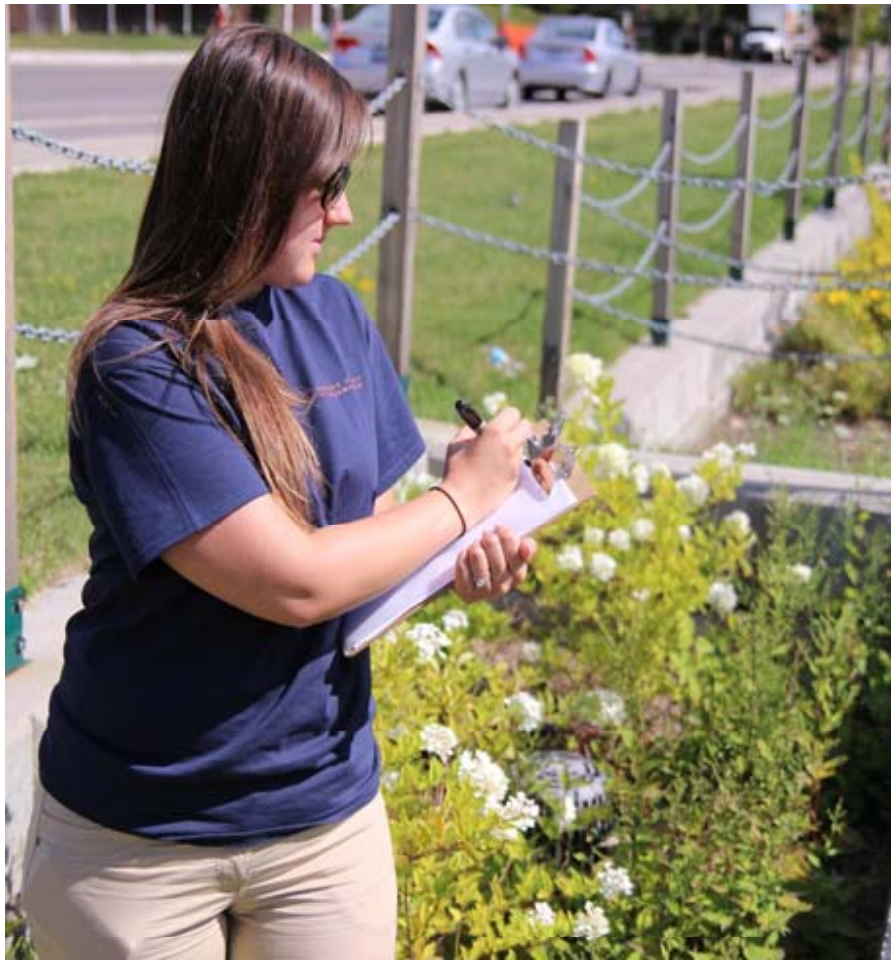
O&M Contracts and Agreements

- Subdivision and site plan agreement
- Warranty period
- Assumption / Final Acceptance
- Long term maintenance



Inspection of site condition and Photo logs

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Common issues are erosion, inlet blockage, sediment accumulation, water ponding, and vegetation death.

- Maintenance issues can be tracked over time to see if they are design or site related
- Maintenance schedules will provide insight as to when issues are addressed, how frequently, and if they are resolved
- Routine maintenance will be more cost efficient in the long-term if small issues are addressed more frequently than leaving them to develop into larger problems

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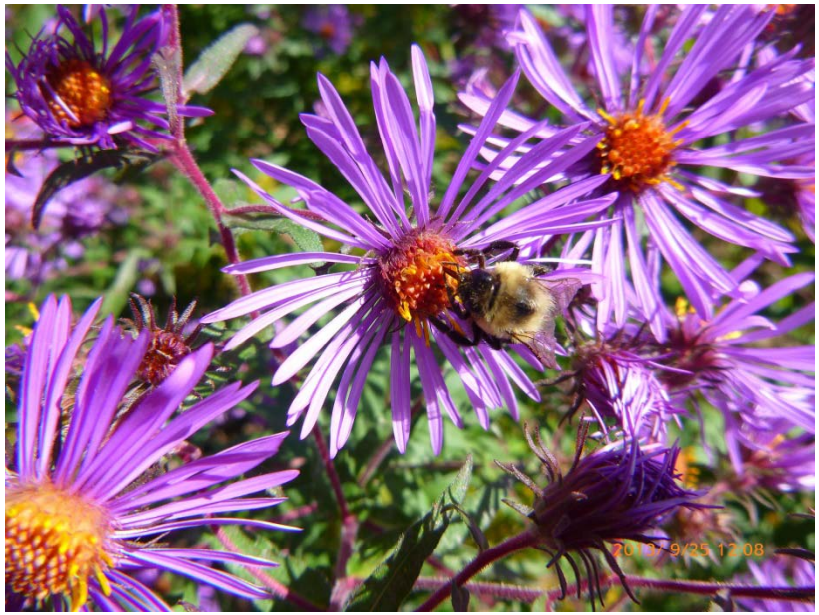
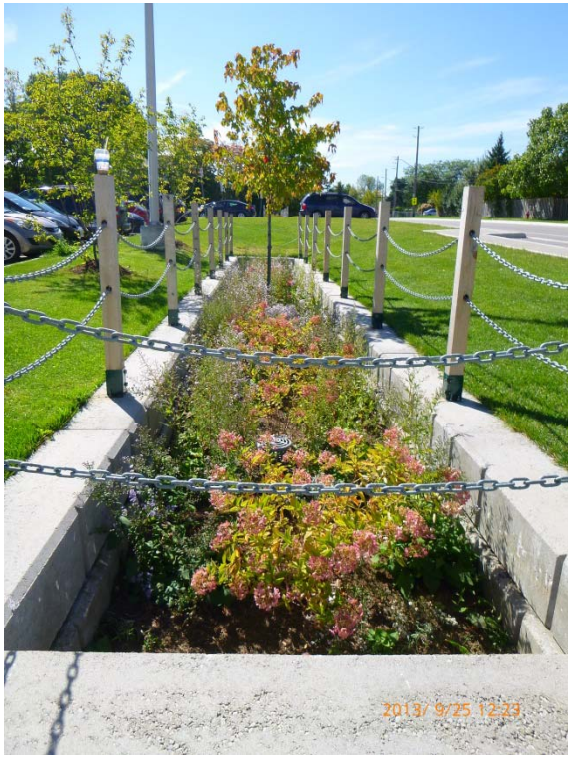
Visual issues are just as important as structural issues as the public wants to see an attractive feature. This is why it is important to both inspect structural features to ensure functionality as well as visual feature to ensure an attractive site is well maintained.





O&M Tasks

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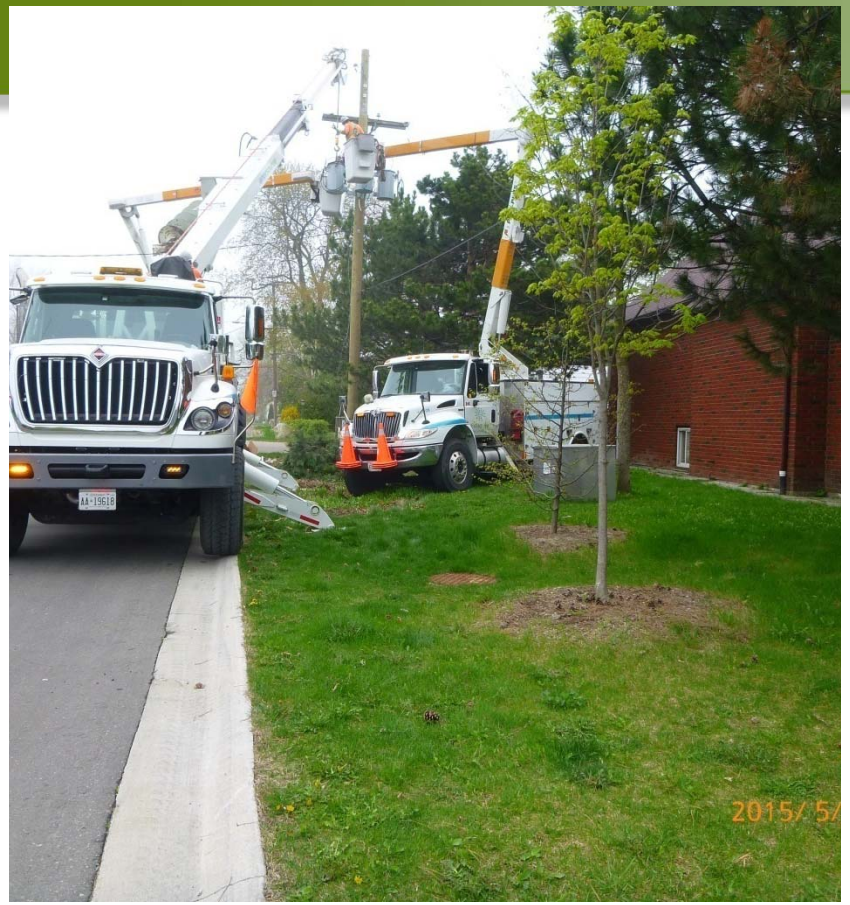

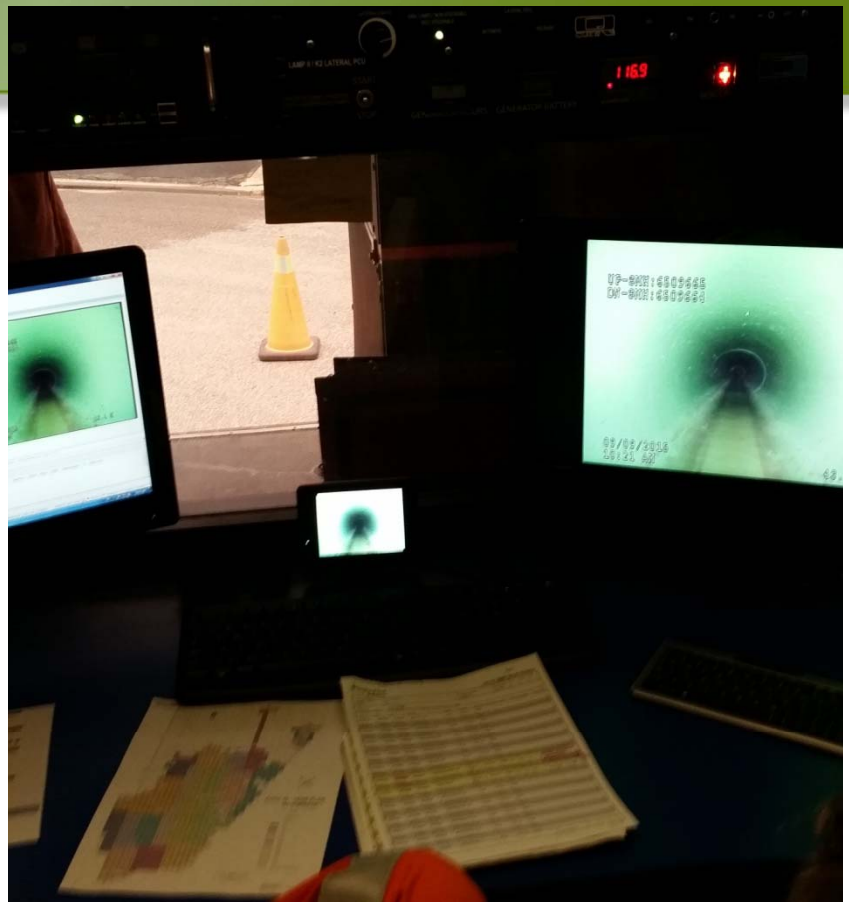

Asset Management

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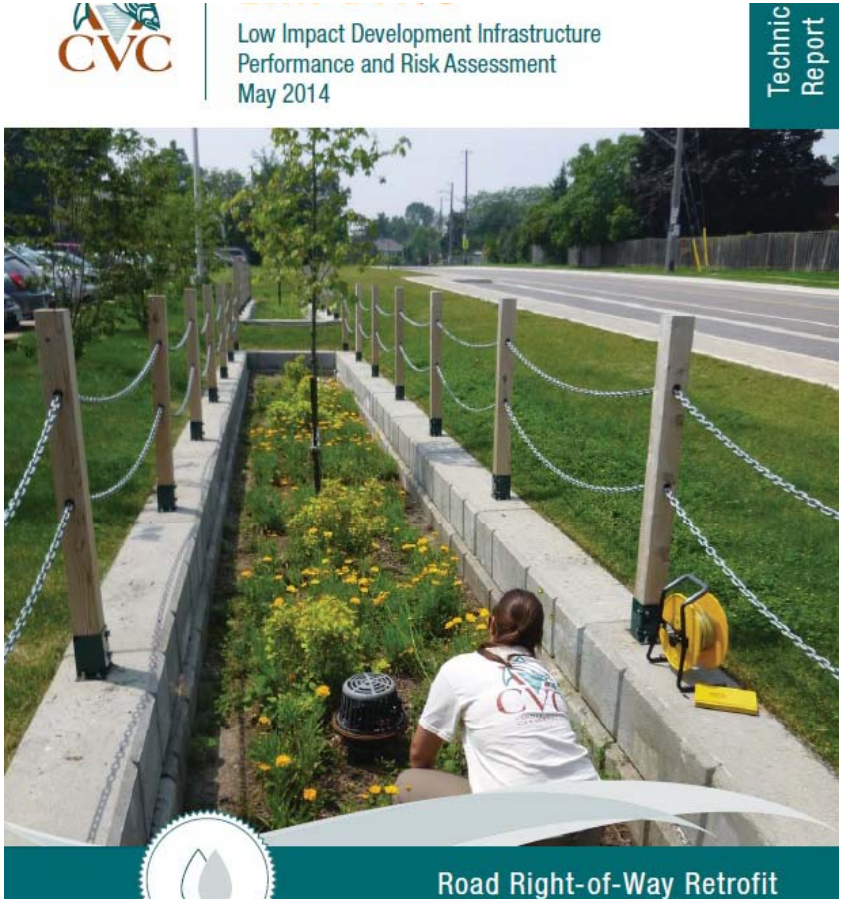
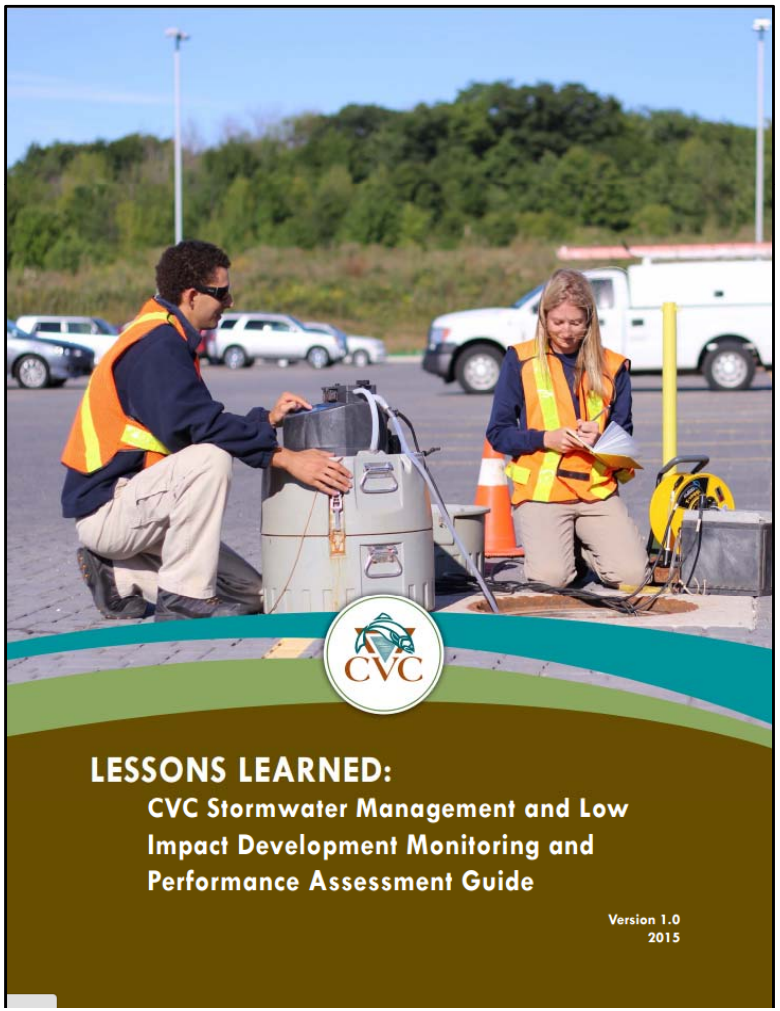


Education & Outreach

Lessons Learned: CVC Stormwater Management and LID Monitoring and Performance Assessment Guide

http://www.creditvalleyca.ca/wp-content/uploads/2015/08/Monitoring-Guide_DRAFT.pdf



Lessons Learned

- Championing the project with municipal, school board and school staff works best when direction comes from top down.
- Demonstration site Water quantity and quality performance is meeting design criteria
- O& M is critical for the long term success and performance of green infrastructure
- O&M needs to be considered in the design and plan review stage
- Resources and guidance is available for O&M and performance monitoring of green infrastructure
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Questions