

Peer Review: Dual-Use Stormwater Facilities Policy Paper

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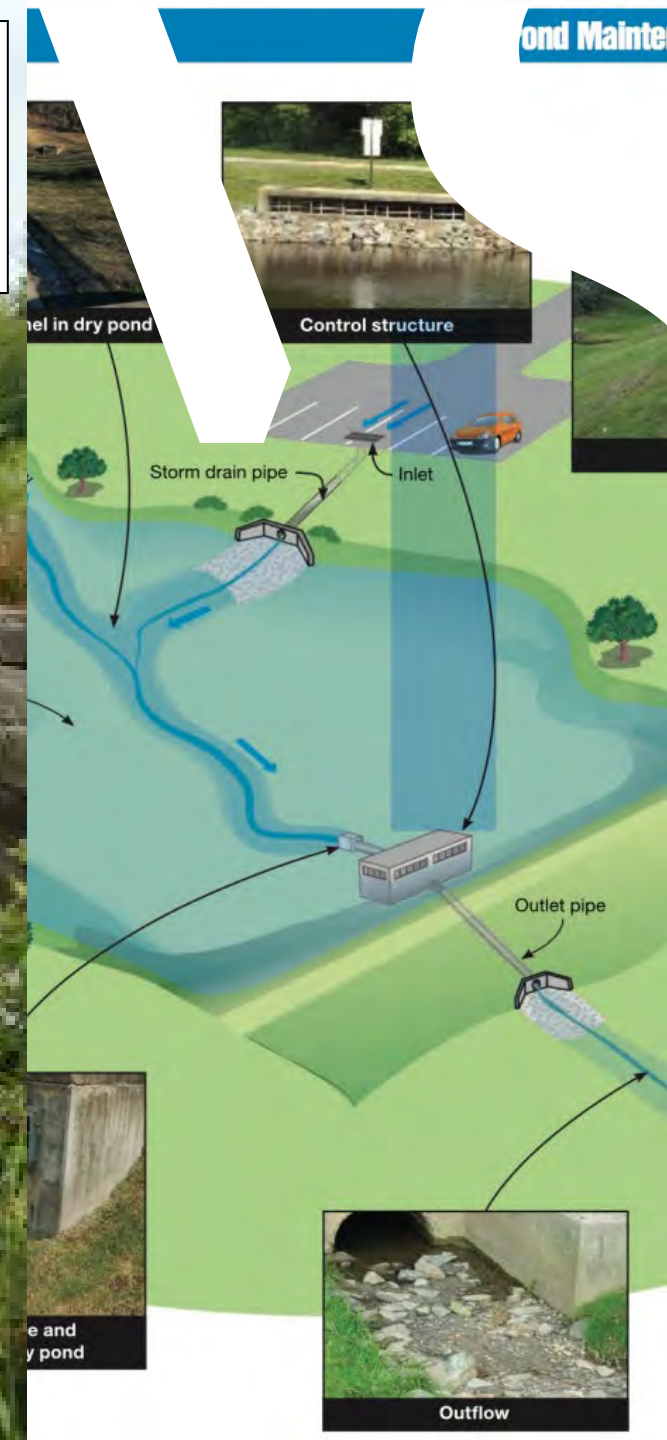
Land Development / Water Resources

COMMUNICATION C1

ITEM NO. 1

COMMITTEE OF THE WHOLE
(WORKING SESSION)

June 8, 2022



Overview





1

Policy Paper

A group of private companies has submitted a “Dual-Use Stormwater Facilities Policy Paper” to the City of Vaughan for consideration to support various land development applications. WSP was retained by the City of Vaughan to peer review this paper.

2

Innovation

Dual-Use Stormwater Facilities (DU/ SWMF) are intended to be installed below grade and allow for an above grade alternative use to better support the surrounding community. This is proposed as an innovation to traditional SWM ponds.

3

What are they?

DU/ SWMF's are large underground storage structures (usually made of concrete) that replace ‘wet ponds’ most often associated with subdivisions and should be explored in intensification areas.

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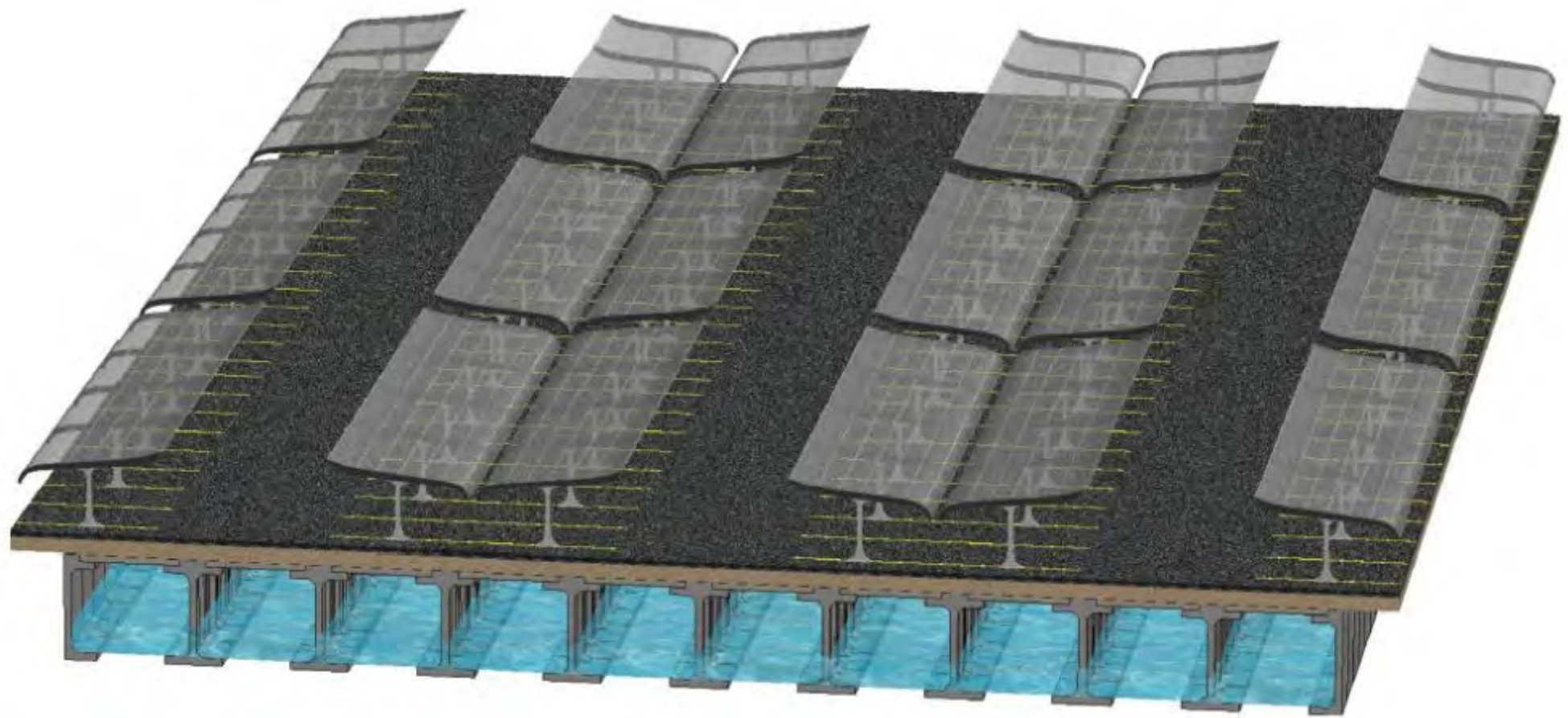
Why?

Land prices are accelerating and are projected to remain at levels that make UGSWMF's financially feasible for developers

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City of Vaughan

Existing ponds in Vaughan remain effective, but DU/ SWMF's have some added benefits.

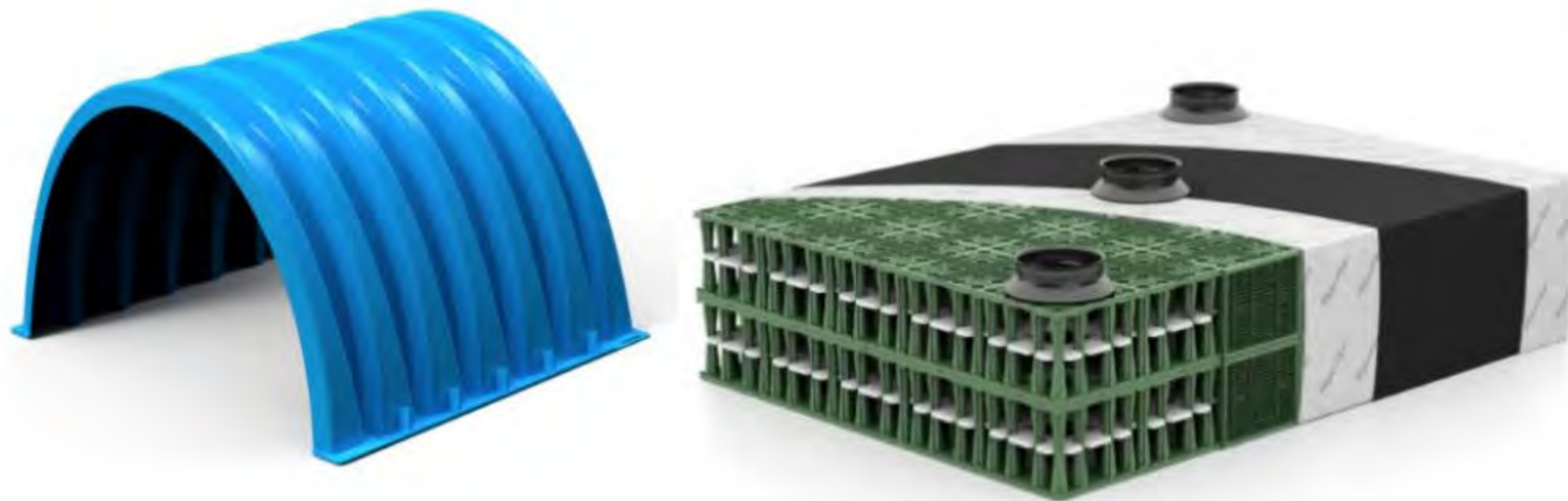


The I-Storm System by DeCast Ltd.



The I-Storm System by DeCast Ltd.

Figure 7: Sample PVC Prototypes



Source: StormCon

Pros/Cons

PARAMETER	TRAD. SWMF	DU-U/G SWMF	NOTES: DARKER CIRCLES IMPLY IMPROVED PERFORMANCE
Cost			
Land Value	○	●	High land values favor U/G SWMF.
Capital Cost	●	○	Trad: Capital Costs nominal (earthworks). U/G: Capital costs 2 – 3x higher.
Maintenance	◐	◐	Trad: untidy, long restoration periods. U/G: offers quicker, outsourced maintenance.
Social			
Safety	◐	●	Trad: accessible open water. U/G: no open water areas.
Aesthetics	◐	◐	Trad: Ponds with open water. U/G: turf areas
Nuisance	○	◐	Trad: perceived as illness vectors (West Nile, unclear water). U/G: non-preferred habitat for vector biology.
Recreation	◐	◐	Trad: passive options. U/G: park related options only.
Environmental			
Thermal	○	●	Trad: thermal aggradation issues. U/G: acts as heat sink to cool discharges.
Water Quality	◐	●	Trad: has integrated treatment via gravity settling. U/G: off-line treatment with addtl options for filtration.
Footprint	◐	●	Trad: pond sloping required. U/G: Vertical walls.
Erosion	◐	◐	Both options dependent on design
Infiltration	○	◐	Trad: generally, not feasible. U/G: Infiltration feasible.
Constructability			
Complexity	◐	◐	Trad: open excavation, earthen composition. U/G: confined space entry, need for air displacement, structural analysis, etc.
Materials	◐	◐	Trad: Native materials with less concrete. U/G: Increase in imported concrete
Operations			
Simplicity	◐	◐	Trad: Batch-flow and plug-flow system dynamics. U/G: Offline treatment followed by storage.
Recovery	○	◐	Trad: Vegetation recovery slow with disturbed soils. U/G: Same-day recovery after maintenance.
Advantage	✗	✓	

Summary

Cost/Benefit Analysis

Costs are anticipated to be variable between conventional and DUSWMF approaches

PARAMETER	TRAD. SWMF	DU-U/G SWMF	NOTES: DARKER CIRCLES IMPLY IMPROVED PERFORMANCE
Advantage	✗	✓	

Cost: Variable depending design parameters and environmental context..

Social: Slight advantage to traditional SWMF

Environmental: Strong advantages for DU/ UGSWMF's

Constructability: Med. strong advantage for traditional due to less materials and complexity

Operations: Strong advantage for DU/ UGSWMF's due to simplicity of flow hydraulics. Inspections are complicated with non-conventional SWMF's.

Water Quality

Water Quality treatment is highly recommended to be installed off-line to large UGSWMF installations, via treatment train-based approaches at the surface for ease of operation/ maintenance. Integrated water quality treatment inside an UGSWMF will have negative impacts.

Insects, Wildlife, related Human Concerns

Mosquito habitat is not generally associated with open water wet ponds or UGSWMF's. West Nile Virus vectors are not likely to be affected by DUSWMFs. Removal of open water discourages geese, and other unintended uses of SWM ponds



4

Odour Issues

UGSWMFs are susceptible to low Dissolved O₂ concentrations, which allow for the generation of noxious odours, such as Hydrogen Sulfide. UGSWMF's should be configured to fully empty between storm events.

5

Operations & Maintenance

Maintenance of UGSWMF's may be performed by the tank manufacturers until the City has sufficient training and resources to take over after an extended maintenance period and assumption by the City.

6

Out of Sight – Out of Mind

UGSWMF's should require robust “as-built” drawings as confirmation of conditions in the future will not be convenient and require daylighting or other invasive inspections for activities in close proximity. WSP recommends a robust drawing & design reporting archival system and a SCADA system integration.

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City of Vaughan

UGSWMF's have good potential to conserve land, but are not a 1:1 replacement for wet ponds. Additional training, effort and O&M adjustments will be necessary by City staff.



Thank you