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Rocky View County
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Attention: Ms. Angela Yurkowski, P.Eng.
Capital Project Management Supervisor

Dear Ms. Yurkowski:

Re: Rocky View County Development Comparison

Rocky View County (RVC) has a number of Area Structure Plan (ASP) areas that intend to connect their stormwater systems to the future Cooperative Stormwater Management Initiative (CSMI) system. CSMI requires a unit area release rate (UARR) of 0.8 l/s/ha and a volume control target (VCT) of 40 mm/year for RVC's areas.

The existing developments in these areas are currently under a zero-release requirement. RVC has requested information in order to compare estimated storage requirements of a zero-release condition versus what will be a typical CSMI condition. For this comparison, the existing high level CSMI land development PCSWMM models have been utilized, and similar PCSWMM models are been created to represent a zero-release development.

The following three scenarios are analyzed for a typical industrial and residential development:

1. ***CSMI Development***: Developments which meet the UARR and VCT set by CSMI, using stormwater Best Management Practices (BMPs) such as Low Impact Development (LID) practices.
2. ***Zero-Release Development with LIDs***: Developments which meet a zero-release requirement and apply the same stormwater BMPs as a CSMI development.
3. ***Zero-Release Development without LIDs***: Developments which meet a zero-release requirement and do not utilize any LID practices.

Model Assumptions

Both single event and continuous models are analyzed for each development type in order to obtain the most representative results. Single event models utilized the City of Calgary Chicago distribution 1:100 year 24 hour event, and the continuous models used the Calgary International Airport 50-year data for precipitation, evaporation and temperature.

The size of the typical developments modelled are 100 ha for both the residential and industrial analysis. Separate subcatchments are used in the models for the different types of land use [Roads, Lots, Municipal Reserve (MR) and Environmental Reserve (ER)]. For a direct comparison, ***Table 1*** shows the main parameters of these subcatchments that remain consistent throughout all scenarios. Typical infiltration, depression storage and roughness coefficients are also kept consistent.

Table 1: Consistent Model Parameters

Parameter	Value	
	Industrial	Residential
Total Development Area	100ha	100 ha
Road Area	5.5ha	12.5 ha
MR and ER Area	12.3 ha	11 ha
Lot Imperviousness	85%	44%

A single storage facility is utilized to collect runoff from the entire 100 ha development model. Where LID's are included, water is pumped out of this storage to facilitate these practices. General storage characteristics are maintained throughout the scenarios to be able to compare storage surface area directly (***Table 2***).

Table 2: Consistent Storage Parameters

Parameter	Value
Depth Below HWL	4 m
Freeboard Storage Above HWL	0.5 m
Simulation Starting Depth	2 m
Storage Side Slopes	1:5
Storage Infiltration	0%

The CSMI development (Scenario 1), assumes a depth below Normal Water Level (NWL) of 2 m, as this is the only scenario that allows the storage to release. It is noted that a typical zero-release development usually includes a shallower storage depth, however altering this would not greatly impact overall storage area required.

LID practices utilized in the CSMI model, which are kept consistent in Scenario 2, include:

- Absorbent landscape utilized on lots,
- 50-60% of runoff from impervious lot area directed to the absorbent landscape prior to the outlet,
- Irrigation of the MR area,
- Recharging of wetlands within the ER area,
- Non-potable reuse such as toilet flushing (industrial developments only).

Scenario 3 assumes that no LID practices are utilized, therefore the development relies strictly on evaporation to prevent flooding.

Results

Storage surface area is altered in all scenarios to determine the size required to avoid flooding. ***Table 3*** shows the resulting percentage of development area utilized by the storage freeboard level in each development model scenario.

Table 3: Storage Surface Area Results

Development Type	Freeboard Surface Area (% of Development)		
	CSMI	Zero Release with LIDs	Zero Release without LIDs
Industrial	4.2%	9.7%	33.2%
Residential	3.7%	7.4%	21.7%

It can be seen that the storage area required for a zero-release development (utilizing LID practices) is approximately double the area required for a typical CSMI development. In addition to this, storage within a typical zero-release development with no LIDs may be 22% to 33% for large industrial and residential developments, respectively.

Should you have any inquiries in regards to the analysis completed, please do not hesitate to contact the undersigned at (403) 219-6322.

Yours truly,

MPE ENGINEERING LTD.

Tayler Marra, P. Eng.
Design Engineer

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