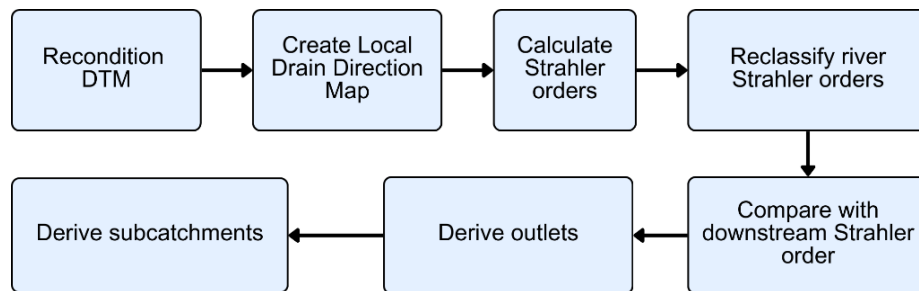


## Supplementary Material

### 1 Subcatchment Delineation

Subcatchment delineation was performed in QGIS using the built-in delineation tools from the *PCRaster* plugin. The Digital Terrain Model (DTM) and building footprints of UP Diliman were used as the primary input files in delineation. Supplementary Figure 1 shows the steps followed in delineating the subcatchments.



**Supplementary Figure 1.** Steps in Subcatchment Delineation using PCRaster in QGIS

In urban catchments, it is crucial to reflect the building footprints and locations in the DTM as building perimeters do not permit the flow of stormwater inside the building (Lumbera, 2018). As a result, this has been reflected by uniformly raising the pixels from the DTM that intersected with the building footprints using the raster calculator tool. In theory, this reflects how water does not enter the building. Shown in Supplementary Figure 2 is the reconditioned DTM.



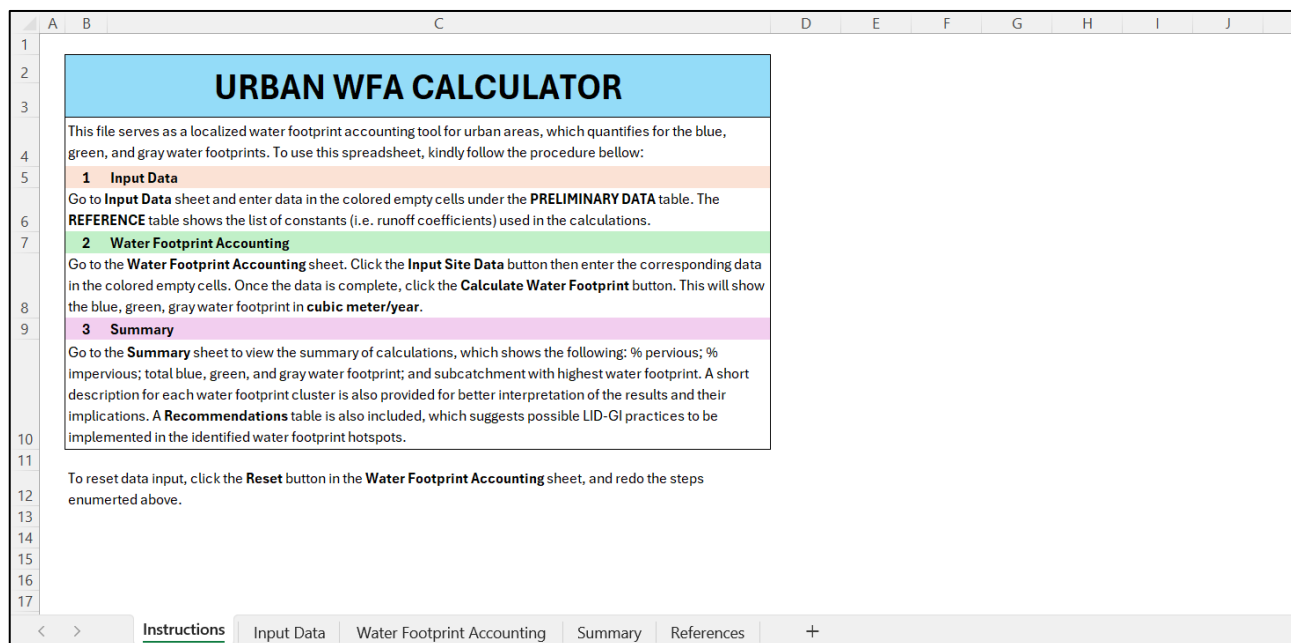
**Supplementary Figure 2.** Reconditioned DTM of UP Diliman.

Following this, the local drain direction map was then created with the reconditioned DTM as input. This step fills all sinks and creates the flow direction map. The Strahler orders were then calculated from the local drain direction map, which classifies the hierarchy of streams. Strahler orders were reclassified to calibrate which orders are considered streams. The Strahler orders of the downstream were then derived, then compared with the Strahler orders of the stream. From this, the junctions and outlets were identified. With known locations of the outlets, the subcatchments were derived.

## 2 Water Footprint Accounting Spreadsheet Tool

The following supplementary figures show the interface of the generated WFA spreadsheet tool. The developed tool is in the form of an Excel spreadsheet, which consists of five sheets: (1) Instructions, (2) Input Data, (3) Water Footprint Accounting, (4) Summary, and (5) References.

The first sheet (Supplementary Figure 3) is the instructions sheet, which briefs the user on how to use the spreadsheet tool (i.e., colored empty cells are user data input). It introduces the user to the tool and provides an overview for each of the succeeding sheets.



**Supplementary Figure 3.** Sheet 1 interface.

The next sheet (Supplementary Figure 4) is the input data sheet where the user will enter preliminary data on the following: number of subcatchments, land area, evapotranspiration data, wastewater pollutant data, and road runoff pollutant data. A brief description for each cell of data input is included in the sheet, placed beside the input cell.

The number of subcatchments is based on the output from subcatchment delineation. Land data is the basic information of the study site, specifically, the name of the study site, total area, and annual rainfall amount based on a reference year. The evapotranspiration data requires wind, temperature, humidity, and solar radiation data specific to the site. Wastewater and road runoff pollutant data are based on water quality reports that show the concentration of pollutants in the wastewater and road runoff, water quality standard of the pollutant, and the concentration of the pollutant in the receiving

water body. Upon inputting the parameters in the spreadsheet, it immediately shows the resulting pollutant factor. The maximum pollutant factor must be the final input.

Moreover, this sheet also contains a reference table of the runoff coefficients for different pervious and impervious area types that the spreadsheet will use in water footprint accounting. Since there are different land cover types, it is important to categorize pervious and impervious area types of the study site accordingly as different runoff coefficients are applied.

A	B	C	D	E	F	G	H	I	J
1	<b>PRELIMINARY DATA</b>				<b>REFERENCE</b>				
2	<b>NUMBER OF SUBCATCHMENTS</b>				number of defined subcatchments for spatially detailed WFA				
3									
4	<b>LAND DATA</b>								
5	Study Site Name				name of the site				
6	Study Site Area (m2)				surface area of the site				
7	Rainfall (mm)				annual rainfall				
8									
9	<b>EVAPOTRANSPIRATION DATA</b>				reference date of evapotranspiration data				
10	Reference Date (MM/DD/YYYY)				latitude of study site				
11	Latitude (°)				wind speed at given height				
12	Wind Speed at height z (m/s)				height at which wind speed is measured				
13	Height of measurement about ground, z (m)				minimum air temperature				
14	Minimum Temperature (°C)				maximum air temperature				
15	Maximum Temperature (°C)				minimum relative humidity				
16	Minimum Relative Humidity (%)				maximum relative humidity				
17	Maximum Relative Humidity (%)				amount of sunlight				
18	Solar Radiation (MJ/m2-d)				estimated monthly evapotranspiration				
19	Evapotranspiration (mm/month)								
20									
21	<b>WASTEWATER POLLUTANT DATA (highest pollutant factor)</b>								
22	Pollutant				dominant pollutant				
23	Pollutant Concentration of Effluent (mg/L)				pollutant concentration of effluent				
24	Ambient Water Quality Standard of Pollutant (mg/L)				maximum allowable concentration				
25	River Background Level of Pollutant (mg/L)				natural concentration in receiving water body				
26	Pollutant Factor				pollutant factor, (cR - cST)/(cST - cNAT)				
27									
28	<b>ROAD RUNOFF POLLUTANT DATA (highest pollutant factor)</b>								
29	Pollutant				dominant pollutant				
30	Pollutant Concentration of Runoff (mg/L)				pollutant concentration of effluent, cR				
31	Ambient Water Quality Standard of Pollutant (mg/L)				maximum allowable concentration, cST				
32	River Background Level of Pollutant (mg/L)				natural concentration in receiving water body, cNAT				
33	Pollutant Factor				pollutant factor, (cR - cST)/(cST - cNAT)				
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35									
36									

**Supplementary Figure 4. Sheet 2 interface.**

The third sheet (Supplementary Figure 5) is the water footprint accounting sheet, which includes another set of data input and where the results of water footprint accounting would be presented.

Users will first see a blank sheet with 3 buttons, as shown in Supplementary Figure 5. Upon clicking the *Input Site Data* button, it would show the *Site Area Data* table with a number of rows corresponding to the number of subcatchments that have been defined. In this table, the user would input subcatchment-specific data: the pervious area, impervious area, water consumption, and wastewater generation. The pervious and impervious area are further divided into different types, as specified in the reference table from the second sheet. The first column in the *Site Area Data* table also shows the subcatchment number with format “S#”, referring to the unique ID code assigned to each subcatchment after delineation in GIS software.

After data input is complete, the user may now click the *Calculate Water Footprint* button to show the resulting amounts of the blue WF of buildings, blue WF of rainwater, green WF, gray WF of buildings, and gray WF of stormwater. This would create an additional table beside the *Site Area Data* table that would present the resulting water footprint per cluster. Supplementary Figure 6 shows a sample table interface for eight subcatchments.

Supplementary Figure 5. Sheet 3 interface.

Supplementary Figure 6. Sample Sheet 3 interface with dummy input data.

The next sheet (Supplementary Figure 7) is the summary sheet, which provides an overview of the results from the WFA. It shows the total pervious and impervious area, total water footprint per cluster, and the subcatchment with the highest water footprint per cluster. The total pervious and impervious areas will be shown in percent with a supporting pie chart. The total water footprint is summed per cluster instead of obtaining the overall sum of all WF clusters. They cannot be added to get a representative water footprint for the study site as each cluster represents different uses of water (e.g., water consumed, water available for reuse). Lastly, the highest water footprint per cluster is shown by returning the subcatchment number and the subcatchment's corresponding water footprint.

The summary sheet also includes a table of recommendations that provides a list of suggested LID-GI types to be allocated in identified water footprint hotspots, each with at least one recommended LID-GI type. A column is also provided for a brief description for each LID-GI's function.

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SUMMARY

SITE CHARACTERISTICS

Total Pervious Area

#DIV/0! %

Total Impervious Area

#DIV/0! %

TOTAL WATER FOOTPRINT

Total Blue WF - Buildings

Amount of non-potable water consumption and use

0 m<sup>3</sup>

runoff from pervious surfaces

0 m<sup>3</sup>

Total Blue WF - Rainwater

Amount of urban runoff

runoff from impervious surfaces

0 m<sup>3</sup>

total urban runoff

0 m<sup>3</sup>

Total Green WF

Amount of water temporarily stored in soil and plants, then lost through

0 m<sup>3</sup>

Total Gray WF - Buildings

Amount of water needed to dilute the pollutant loads in the wastewater; indicator of severity of pollution

0 m<sup>3</sup>

Total Gray WF - Stormwater

Amount of water needed to dilute the pollutant loads in the runoff; indicator of severity of pollution

0 m<sup>3</sup>

- Total Pervious Area - Total Impervious Area

HIGHEST WATER FOOTPRINT

WF ClusterSubcatchmentAmount

Blue WF - Buildings-0 m<sup>3</sup>

Blue WF - Rainwater-0 m<sup>3</sup>

Green WF-0 m<sup>3</sup>

Gray WF - Buildings-0 m<sup>3</sup>

Gray WF - Stormwater-0 m<sup>3</sup>

HOTSPOTS

Blue WF - Buildings

Blue WF - Rainwater

Green WF

Gray WF - Buildings

Gray WF - Stormwater

LID-GI TYPE

Rainwater Harvesting System

Green Roof

Permeable Pavement

Vegetated Swale

Infiltration Trench

Constructed Wetland

Vegetated Swale

Rainwater Harvesting System

Bio-retention System

FUNCTION

Collects rooftop runoff for reuse in buildings

Absorbs and stores runoff

Collects sidewalk runoff

Manages runoff from yards, parks, and landscaped areas

Receives runoff and enhances soil infiltration

Treats wastewater

Captures stormwater before entering sewer systems

Collects water for reuse in buildings and prevents runoff from entering sewers

Treats polluted road runoff with 85% removal rate

Chuang et al. (2023); Martin-Mikle et al. (2015); Toronto and Region Conservation Authority & Credit Valley Conservation Authority (2010); City of Edmonton (2014)

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Instructions

Input Data

Water Footprint Accounting

SUMMARY

References

+

Supplementary Figure 7. Sheet 4 interface.

The last sheet contains a list of references for the information indicated in the spreadsheet. Supplementary Figure 8 shows the interface of the reference sheet.

REFERENCES									
1. City of Edmonton. (2014). <i>Low Impact Development Best Management Practices Design Guide Edition 1.1</i> . 2. Chuang et al. (2023). <i>Spatial allocation of LID practices with a water footprint approach</i> . 3. Martin-Mikle et al. (2015). <i>Identifying priority sites for low impact development (LID) in a mixed-use watershed</i> 4. MPWH (1987). <i>Design Guidelines Criteria and Standards, Volume 1</i> . 5. Toronto and Region Conservation Authority & Credit Valley Conservation Authority. (2010). <i>Low Impact Development</i>									

Supplementary Figure 8. Sheet 5 interface.