



LANDSCAPE PERFORMANCE SERIES

One Drop at a Time – Elmhurst, IL Methodology for Landscape Performance Benefits Prepared by:

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Environmental

Infiltrates or reuses rainwater falling on the site, preventing up to an estimated 85% of the 1-year storm from entering the local municipal stormwater system and eliminating the need for potable water for irrigation.

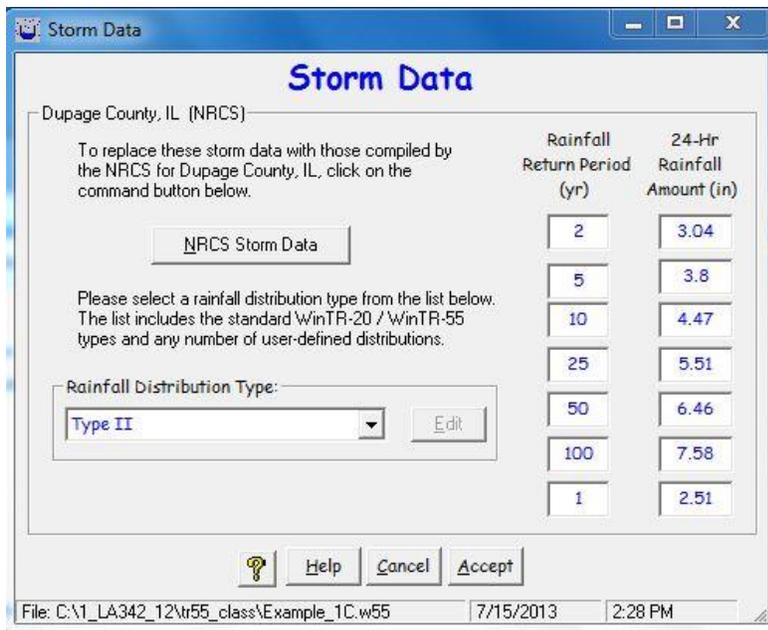
These benefits involved a series of calculations:

- 1) The 24-hour rainfall amount in inches was determined by TR-55 in DuPage County, IL based on rainfall return period from 1year to 100year.
- 2) The equivalent runoff volume in cubic feet was calculated by multiplying the 24-hr rainfall amount in inch by the catchment area 7,500 square feet.
- 3) As storage capacity of the rain gardens is 1,333.33 cubic feet, the ratio of storage volume and runoff volume was estimated by dividing runoff volume by 1,333.33cf.

Rainfall Return Period (yr)	24-Hr Rainfall Amount (in)	Runoff Volume (cf)	Storage (cf)	Storage/Runoff Volume
1	2.51	1568.75	1333.33	0.85
2	3.04	1900.00	1333.33	0.70
5	3.80	2375.00	1333.33	0.56
10	4.47	2793.75	1333.33	0.48
25	5.51	3443.75	1333.33	0.39
50	6.46	4037.50	1333.33	0.33
100	7.58	4737.50	1333.33	0.28

Catchment: 7,500 sf
1cf = 7.48052 US gal
1,333.33x7.48052 gal/cf=9,974 gal

NRCS (Natural Resources Conservation Service) TR-55



In addition, the site's stormwater management system eliminates the need for potable water. By eliminating the need for potable water for irrigation, approximately \$50/year is saved:

- 9,974 gallon x \$.5117/100gal = \$51.03
- Schedule of Rates – Chicago Metro District Water, 2012

Sequesters 140 lbs of carbon annually through prolific uses of native prairie grasses and sedges.

Annual carbon sequestration was calculated using National Highway System sequestration rates as below.

The total area of native prairie grasses and sedges in the rain garden, bioswale, and roof garden is .093 ac and carbon sequestration rate of grasses is .70 metric tons per year.

$$2795 + 664 + 222 + 336 = 4047 \text{ sf}$$

$$4047\text{sf} / 43560\text{sf/ac} = .093 \text{ ac}$$

$$.093 \text{ ac} \times .7 \text{ C/ac/yr} = .0651 \text{ metric tons}$$

$$.0651 \text{ metric tons} \times 2,204 \text{ lbs/metric ton} = 143 \text{ lbs}$$

Estimated annual carbon uptake on the NHS (National Highway System)

	Carbon Sequestration Rates (metric tons C/ac/yr)
Deciduous	2.16
Coniferous	2.26
Mixed	2.21
Grasses	0.70
Shrub	0.70

Social

Educated more than 1,300 visitors through private and public site tours, including 900 visitors during the 2005 Elmhurst Garden Walk, and regular private tours that draw 15-25 people.

Data provided by Marcus de la fleur.

Educated thousands of people worldwide about stormwater management through a website that showcases the various features and provides a narrative about their construction. During peak times, the website had 1,400 visitors and 7,000 pageviews per month.

Data provided by Marcus de la fleur.

Economic

Saved approximately \$5,400 by using salvaged materials and reusing found materials on-site. This also prevented 8.7 cubic yards of materials from entering a landfill.

Money saved:

125 cf concrete path were reused as sub-base.

125 cf / .5 cf/bag x \$3.99/bag = **\$997.5**

8.7 cy soil were reused.

8.7 cy x 27cf/cy = 234.9 cf

\$4.97/cf x 234.9 cf = **\$1,167**

Rain barrels: \$120 x 6 = \$720

Fixtures: \$80

Savings: \$720 - \$80 = **\$640**

Cost estimations for concrete, soil, and the rain barrels were performed based on values from the Home Depot website since we did not have access to construction documents. [Homedepot.com](http://www.homedepot.com)

Underground water tank (550 gallons): \$778.95

<http://www.plastic-mart.com/category/200/underground-water-tanks>

Cistern repair cost: \$80

Savings: \$779 - \$80 = **\$699**

Porous pavement: 1,162 sf

4,741ea x \$.4/ea = **\$1,896**

Number of pavers was estimated using patio paver calculator as below:

<http://www.bhg.com/home-improvement/advice/measuring-materials/patio-pavers-calculator/>

\$997 + \$1,167 + \$640 + \$699 + \$1,896 = **\$5,399**

Volume:

Areas of recycled concrete path, turf, and rain garden were determined by area take-off from AutoCAD drawing. Equivalent volumes of each area were calculated by multiplying the area by the corresponding thickness.

Soil reused:

- Bioswale-1.2 cy
- Turf area 1.0 cy
- Rear rain garden 3.5 cy
- Front rain garden 1 cy
- Pavement 2.0 cy

References:

Borgwardt, S., Gerlach, A., and Köhler, M.; Versickerungsfähige Verkehrsflächen, Anforderung, Einsatz und Bemessung; SpringerVerlag Berlin Heidelberg, 2000

Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V., Guideline for the Planning, Execution and Upkeep of Green Roof Sites, Release 2002

Geiger, W. and Dreiseitl, H.; Neue Wege Für Das Regenwasser, Handbuch zum Rückhalt und zur Versickerung von Regenwasser in Baugebieten; Emshergenossenschaft, Essen und Internationale Bauausstellung Emscher Park GmbH, Gelsenkirchen, 1995

Home Depot website, accessed via: <http://www.homedepot.com>

Rainfall Frequency Atlas of the Midwest, Bulletin 71, Midwestern Climate Center (MCC) Research Report 9203

Richmond Regional Planning Commission, Sun Trust Bank Green Roof, accessed via:
http://www.richmondregional.org/planning/stormwater/green_roof.htm

U.S. Federal Highway Administration, Carbon Sequestration Pilot Program, accessed via:
http://www.fhwa.dot.gov/environment/climate_change/mitigation/resources_and_publications/carbon_sequestration/index.cfm