

Greening Your Community

Cost-effective LID solutions



conserve



restore



protect



save money

#5 of 5

supplement

Supplement to Fact Sheet 5 of 5 Calculation of the Cost Comparison in Leominster By Scott Horsley, Horsley Witten Group, Inc.

Nutrient Reduction

The CEI Pollutant Load Reduction Model developed for the Mass DEP was used to calculate annual pound of sediment, phosphorous, and nitrogen collected by street drainage systems. The annual load at each site was determined using the formula:

$$L = 0.226 * R * C * A$$

Key		
In Equation	Meaning	Unit
L	Annual load	Lbs
R	Annual runoff	Inches
C	Pollutant concentration	Mg/l
A	Area	Acres
0.226	Unit Conversion Factor	

The project found the pollutant loads of TSS, total phosphorus (TP), and total nitrogen (TN) at each site, and determined the size of the LID feature needed to manage the nutrients from type of land use. The Rockwell Pond Project included information on nutrient reduction in its final report, and from their numbers, the restoration efforts led to an annual reduction estimate of 87% TSS, 58% TP, and 58% TN.

Annual Nutrient Reduction Estimates			
BMP Type/Project	TSS Removal	TP Removal	TN Removal
Rain Garden - 1"	90%	65%	58%
Gravel Wetland	99%	64%	85%
Infiltration	90%	65%	58%
Deep Sump CBs	15%	5%	5%
Swale	48%	30%	30%
Rockwell Pond Project	50,502 lbs	18.99 lbs	106.6 lbs
Lower Monoosnoc Project	51,734 lbs	35.95 lbs	117.3 lbs
Total Annual Amount Removed	102,236 lbs	54.94 lbs	223.9 lbs

Cost Analysis

To compare the cost effectiveness of this LID project to conventional practices, the project was evaluated on an annualized present value (PV) basis and then compared to recently published data on conventional stormwater practices (detention basins). Annualized PV costs for this project were calculated by assuming a 20-year lifecycle and adding estimated operation and maintenance costs. Average annual operation and management (O&M) costs were estimated for the LID practices from guidance provided by the UNH Stormwater Center.¹ Comparative costs for conventional stormwater infrastructure were derived from a recent report from the Center for Watershed Protection.² Operation and maintenance costs were estimated on a \$/lb of nutrient removed for two representative LID practices used in the case study (gravel wetland and bioretention).

Capital Costs Over An Estimated 20-Year Life Cycle: Annual Nutrient Removal Load					
Project	capital cost \$	lbs P removed/yr	lbs N removed/yr	Lifecycle Phosphorus (\$/lb)	Lifecycle Nitrogen (\$/lb)
Rockwell Pond	499,448	18.99	106.6	3360	442
Monoosnoc Brook	473,852	39.95	117.3	2638	410

Costs For Representative LID Practices		
LID O&M Costs (UNH)	Phosphorus (\$/lb)	Nitrogen (\$/lb)
Gravel wetland	1364	127
Bioretention	2727	290
Average	2045	209

Total Annual Present Value Costs			
Leominster Project Lifecycle	Cost Type	Phosphorus (\$/lb)	Nitrogen (\$/lb)
Rockwell Pond	Capital cost	1315	234
	O&M	2045	209
	Total	3360	443
Lower Monoosnoc	Capital cost	593	202
	O&M	2045	209
	Total	2638	411

Learn More

For more information, including all five fact sheets, a local land use regulatory review template, presentations, references, and related resources check out www.massaudubon.org/shapingthefuture.



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