



Storm Water Erosion Mitigation for the Eagle Heights Community Gardens





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Hydrology &
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Agenda

- Project Introduction
- Scope of Work
- Design Alternatives
- Final Design
- Schedule and Budget
- Future Work



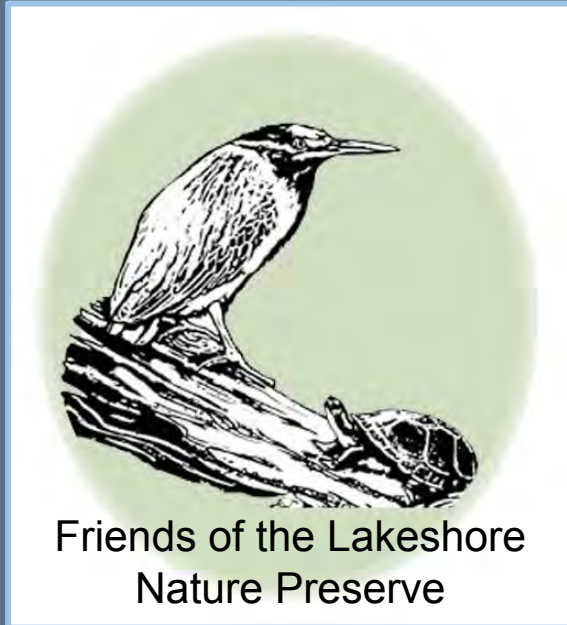


Project Introduction





Project Introduction



Friends of the Lakeshore
Nature Preserve



The Friends and Shorewood Engineering

Project Area



Project Area





Project Area

BioCORE Prairie





Summary of Problem

- Compost stockpile at bottom of drainage basin
- Poor storm water management infrastructure
- Erosion in Bill's Woods





Scope of Work



Scope of Work

- Manage runoff
- Decrease nutrient transport
- Increase infiltration
- Reduce erosion





Design Constraints and Challenges

- Cost
- Space availability and constructability
- Garden and stockpile preservation





Design Alternatives



Project
Introduction

Scope of
Work

Design
Alternatives

Final
Design

Schedule
and Budget

Future
Work

SHOREWOOD
ENGINEERING



Design Concept:

Divert storm water around stockpile area.



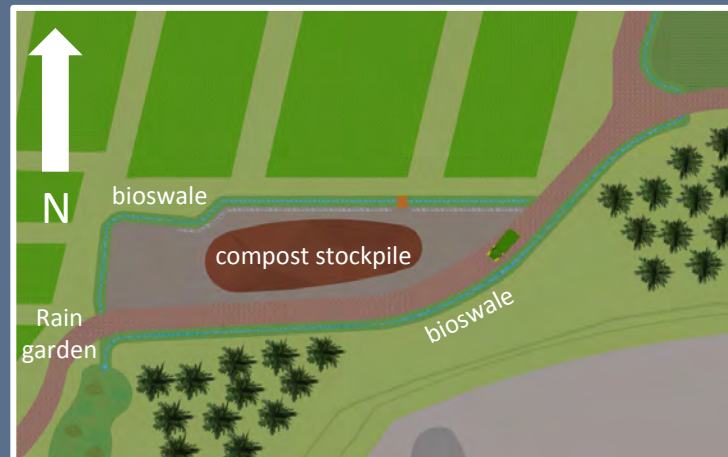
Alternative 1

- Bioswale
- Rip rap erosion protection
- Jersey barrier boundary



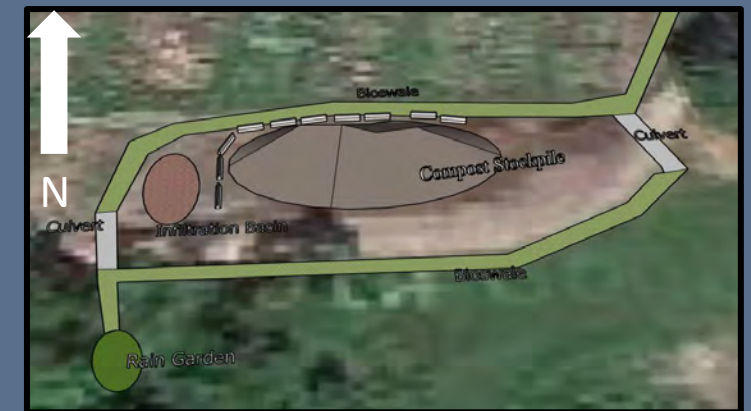
Alternative 2

- Bioswale
- Adjust existing road
- Rain garden in Bill's Woods
- Jersey barrier boundary



Alternative 3

- Bioswale
- Adjust existing road
- Rain garden in Bill's Woods
- Infiltration basin
- Jersey barrier boundary





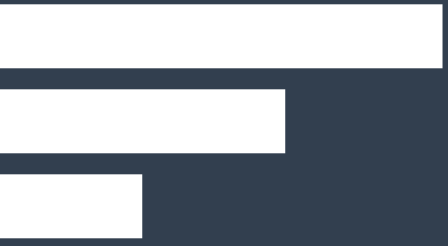
Alternative 2: Bioswales, Road Adjustment and Rain Garden

- Bioswale
- Culverts under existing road
- Regrade existing road
- Rain garden in Bill's Woods
- Jersey barriers



Alternative 3: Bioswales, Road Adjustment, Rain Garden and Infiltration Basin

- Bioswale
- Culverts under existing road
- Regrade existing road
- Infiltration basin east of compost stockpile
- Rain garden in Bill's Woods
- Jersey barriers



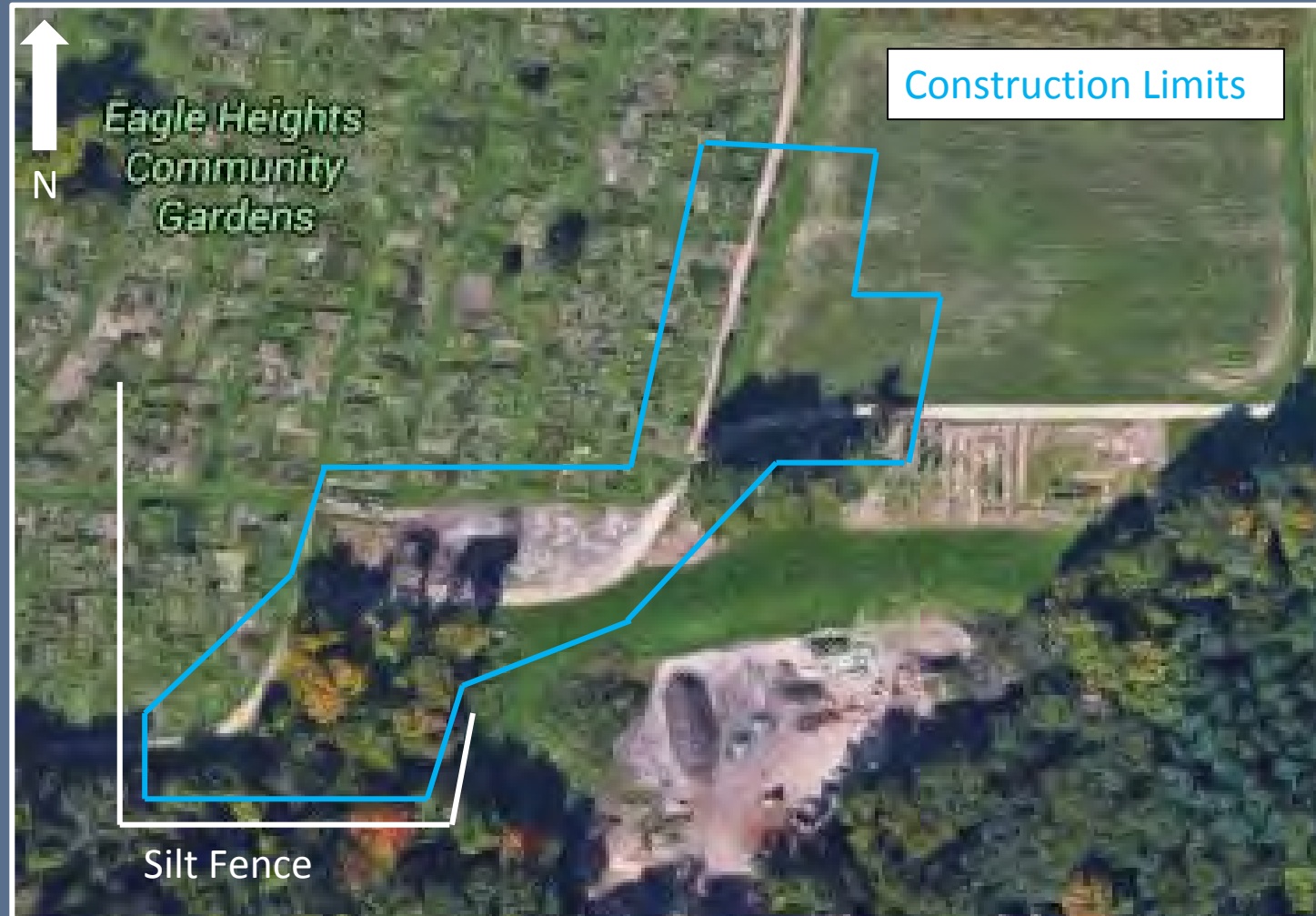
Final Design







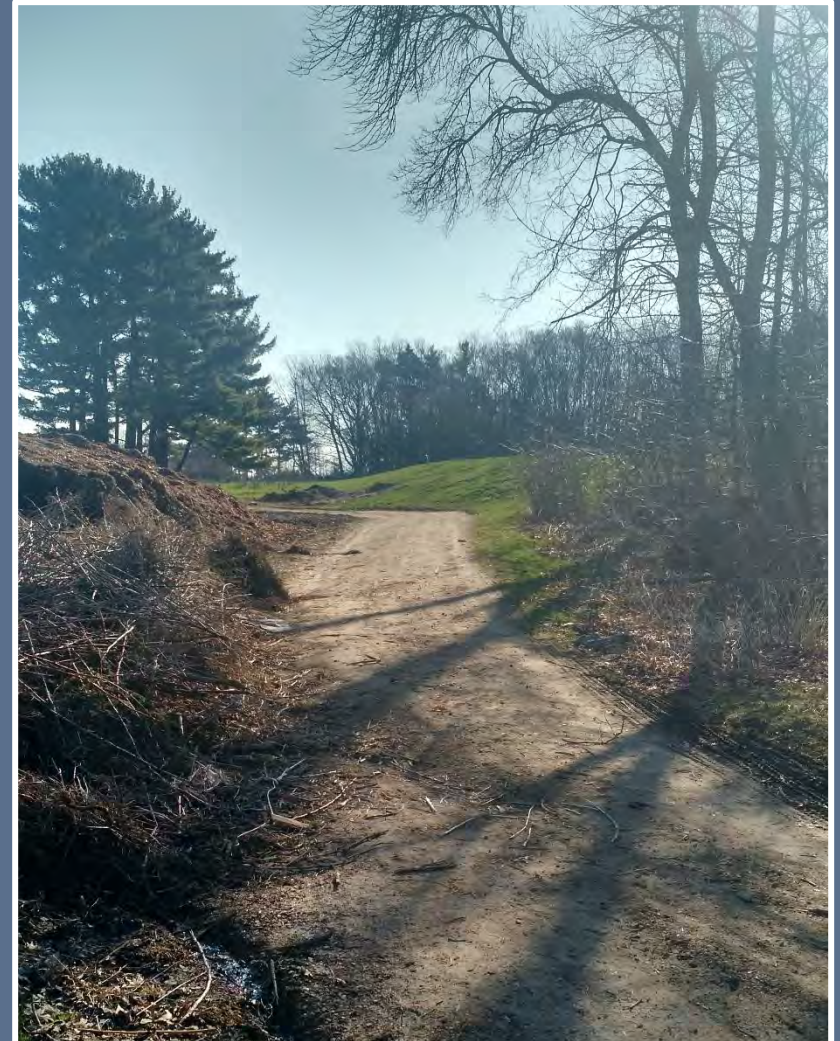
Construction Plan





Final Road Design

- Compacted subgrade layer
- 6" minimum gravel subbase layer
- Regraded to have maximum 2% grade



Drainage Area

4.50 Acres

Recurrence Interval (Years)	Duration (Hours)	Rainfall (Inches)
1	24	2.5
2	24	2.9
5	24	3.6
10	24	4.2
25	24	4.8
50	24	5.3
100	24	6

	2 Year Storm	10 Year Storm	25 Year Storm
Rainfall (in)	2.90	4.20	4.80
Runoff (in)	1.23	2.28	2.80
Peak Discharge (cfs)	2.62	5.26	6.86



Nutrient Removal



	Phosphorus Concentrations (ppm)	Nitrogen Concentration s (ppm)
2012 Soils Capstone Runoff Data from Compost Pile	12.94	37.76
2011 Capital Area Regional Planning Commission Storm Water Data	0.45	0.3

Bioswale

- Vegetated, sloped trench to infiltrate and direct storm water
- Long deep-rooted grasses
- Nutrient and sediment removal

Pollutant	Removal Rate
Total Suspended Solids	70%
Total Phosphorus	30%
Total Nitrogen	25%

Wisconsin DNR, 2000

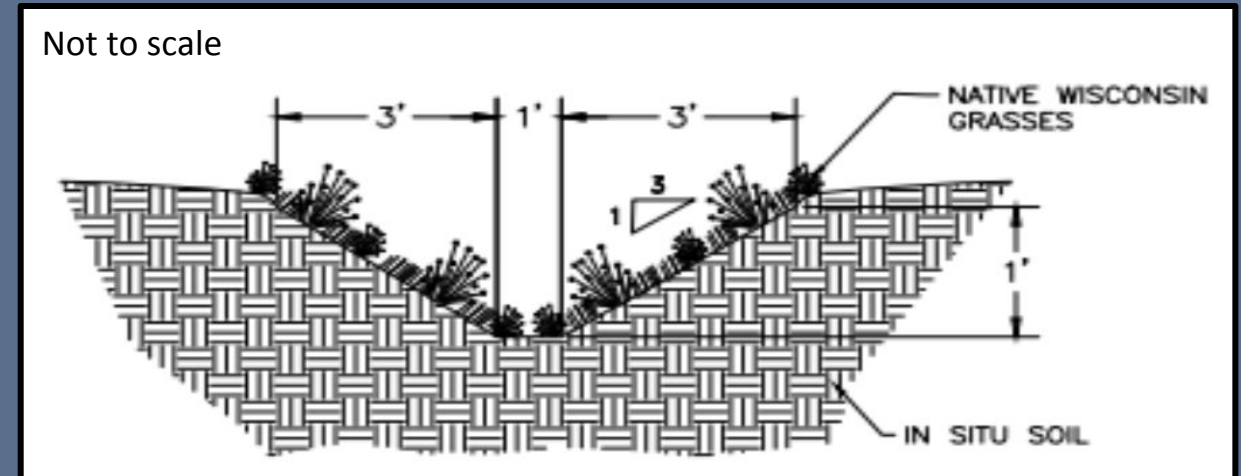


<http://www.cleanwateriowa.org/residential-practices.aspx>



Final Bioswale Design

- 896 ft. long
- 1% - 5% slope
- Native Wisconsin grasses
 - 70% Kentucky Bluegrass
 - 15% Perennial Ryegrass
 - 15% Fine Fescue



Rain Gardens

- Vegetated plot to infiltrate water
- Native deep-rooted plants and grasses
- Erosion protection
- Nutrient and sediment removal

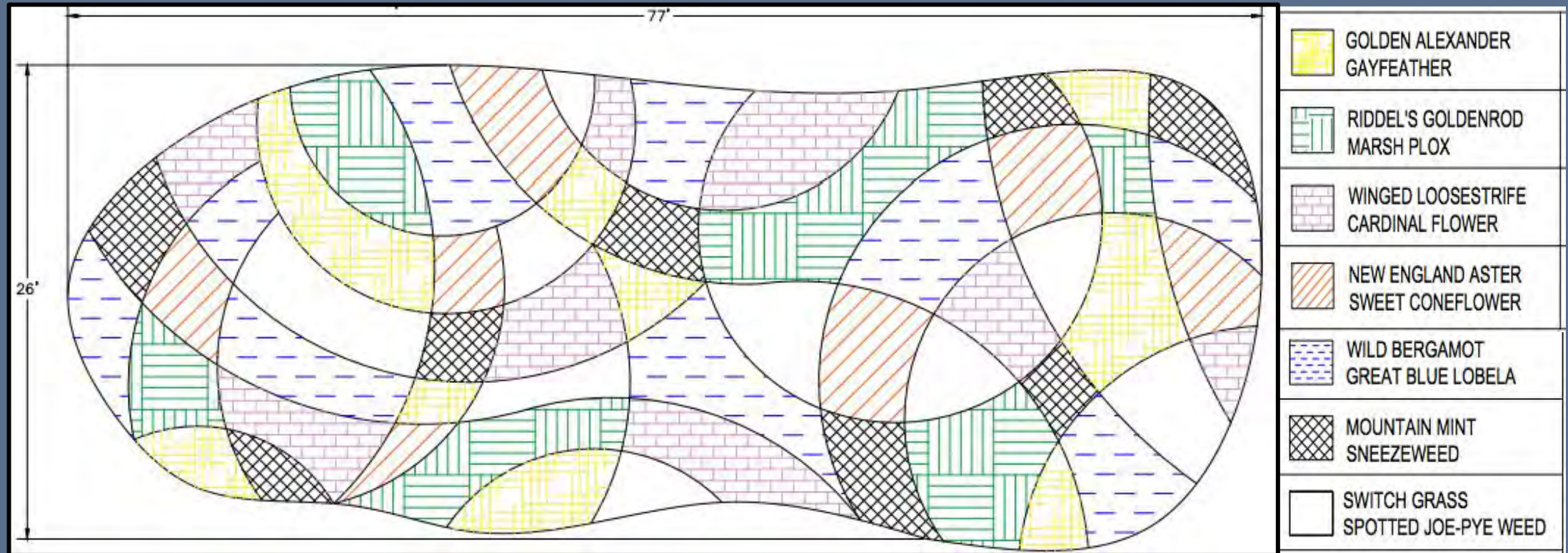
Pollutant	Removal Rate
Total Suspended Solids	58%
Total Phosphorus	62%
Total Nitrogen	72%

Minnesota Pollution Control Agency, 2005



<http://wildoneswildcenter.org/the-rain-garden-gallery/>

Final Rain Garden Design





Final Rain Garden Design

- 2000 ft²

Native plants such as:

Golden Alexanders



<https://www.prairiemoon.com/Zizia-aurea-Golden-Alexanders.html>

Winged Loosestrife



<http://www.thebattery.org/plants/plantview.php?id=154>

Riddell's Goldenrod



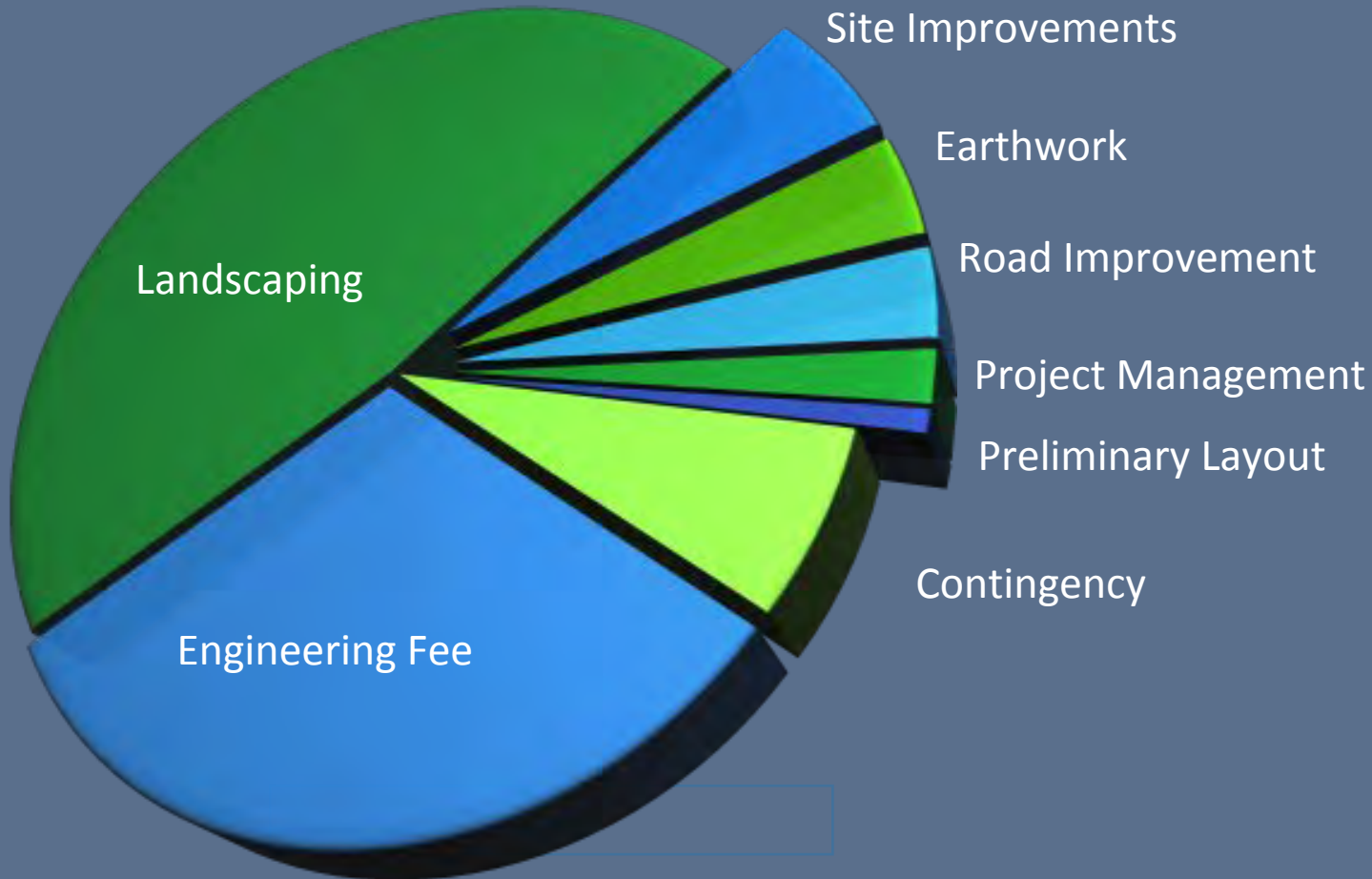


Cost and Schedule





Opinion of Probable Cost



Description	Cost
Preliminary Layout	\$3,000
Earthwork	\$15,000
Road Improvements	\$12,500
Landscaping	\$181,000
Site Improvements	\$21,500
Project Management	\$7,000
Subtotal:	\$240,000
Contingency (10%)	\$24,000
Engineering Fee	\$116,000
Total Project Cost	\$380,000

Operation and Maintenance

Timing	Action	Estimated Yearly Cost
As needed	Water plants	\$500
Following storms	Remove trash and debris	\$500
	Repair eroded or damaged areas	\$1000
Every 3 months	Mow bioswale	\$250
	Remove weeds	\$250
Annually	Rake sediment	\$500
	Reseed and replant if needed	\$500
	Total	\$3500

Approximate Lifespan: 25 years

Anticipated Construction Schedule

ID	Task Name	Duration	Start	Finish	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16	Wk 17
					M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
	Construction Phase	185 days	5/3/16	7/5/16	[Gantt bar spanning from Wk 1 to Wk 17]																
1	RFI Responses	3 days	5/3/16	5/5/16	[Gantt bar: Wk 1, M-F]																
2	Issue Construction Documents	1 day	5/6/16	5/6/16	[Gantt bar: Wk 1, F]																
3	Approvals	60 days	5/6/16	7/5/16	[Gantt bar: Wk 1, F to Wk 9, F]																
4	Bidding Period	50 days	5/17/16	7/5/16	[Gantt bar: Wk 3, M to Wk 10, F]																
5	Award Contract	1 day	7/7/16	7/7/16	[Gantt bar: Wk 10, F]																
6	Notice to Proceed	1 day	7/8/16	7/8/16	[Gantt bar: Wk 10, M]																
7	Mobilization	9 days	7/9/16	7/17/16	[Gantt bar: Wk 10, M to Wk 11, M]																
8	Construction Period	40 days	7/18/16	8/26/16	[Gantt bar: Wk 11, M to Wk 16, M]																
9	Completion & Turnover to Owner	2 days	8/27/16	8/28/16	[Gantt bar: Wk 16, M-F]																



Future Work





Future Work

- Shorewood Engineering
 - Construction quality assurance
 - Project management & coordination
- Friends of the LNP
 - The C.D. Besadny Conservation Grant Program
 - UW departments



Summary of Presentation

Project Goal:

- Decrease the nutrient load
- Increase infiltration



Final Design:

- Bioswale
- Rain Garden
- Road Adjustment

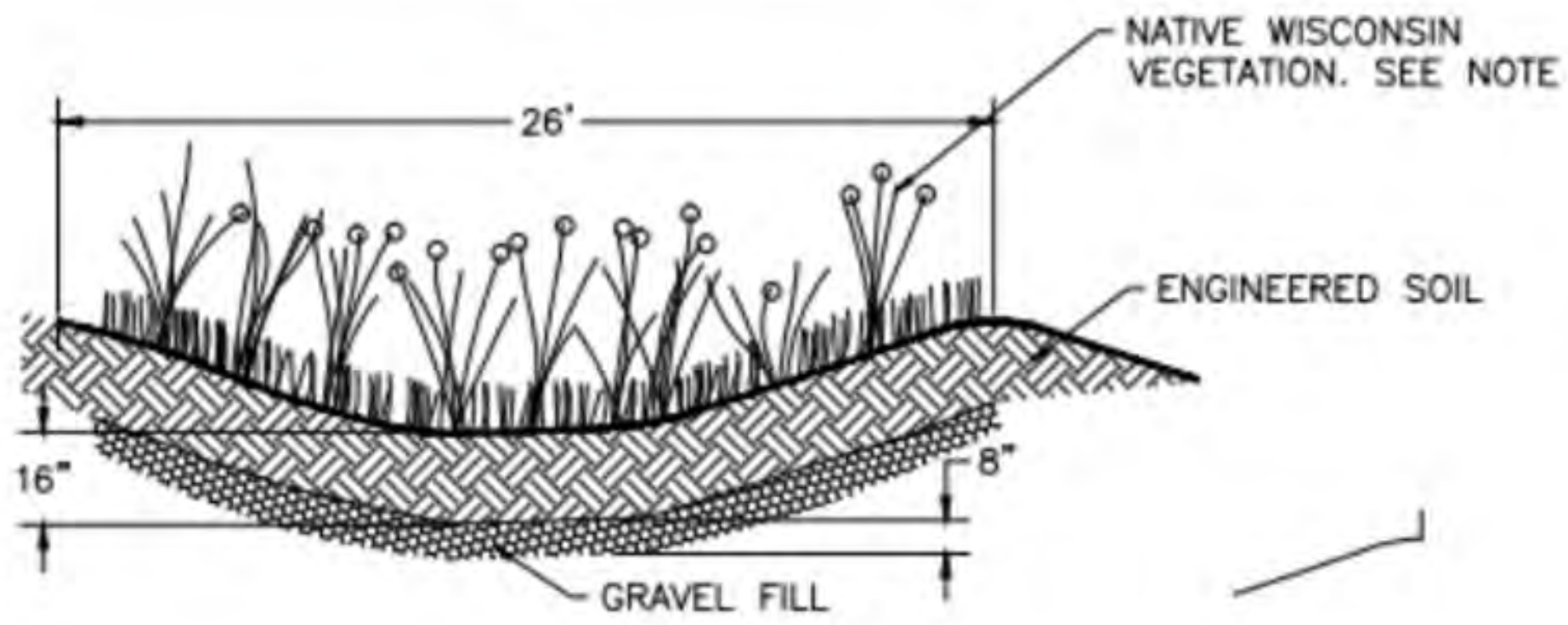






For further questions
please contact:

Maria Kealey,
Project Manager
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Considered Designs

- Extended Berm
- Manhole and Pump
- Pile Cover



Infiltration Basin

- Vegetated basin to contain and infiltrate storm water
- Long dense grass in basin
- Nutrient and sediment removal

Pollutant	Removal Rate
Sediment	99%
Total Phosphorus	65-75%
Total Nitrogen	60-70%

Wisconsin DNR, 2000



<http://archive.inside.iastate.edu/2008/0703/rain.shtml>

Evaluation Matrix

Criteria	Weight	Alternative 1	Alternative 2	Alternative 3
Control of Nutrient Level	15%	4	8	10
Increased Infiltration	15%	4	8	8
Capital Costs	12%	8	4	4
Operation and Maintenance	12%	8	6	4
LNP Preservation	12%	8	4	4
Decrease Erosion in Bills Woods	9%	2	8	8
Ease of Implementation	9%	8	4	2
Convenience to Gardeners	6%	8	8	8
Available Stockpile Space	6%	10	10	2
Road Improvement	4%	0	8	8
	Weighted Score:	61	66	60

Bid Item	Units	Approx. Qty	Estimated Cost
Preliminary Layout			
Survey & Staking	LS	1	\$1,500
Silt Fence	LS	1	\$1,500
Earthwork			
Mobilization	LS	1	\$2,000
Excavation	LS	1	\$13,000
Road Improvements			
Gravel	CY	70	\$3,000
Road Grading & Compaction	LS	1	\$8,000
Geotextile	LS	1	\$1,500
Landscaping			
Site Clearing	LS	1	\$35,000
Seeding & Labor	LS	1	\$2,500
Rain Garden Plants & Labor	LS	1	\$140,000
Geotextile	LS	1	\$1,500
Gravel	LS	1	\$2,000
Site Improvements			
6" Corrugated Metal Culverts	Each	4	\$1,000
Jersey Barriers	Each	18	\$20,000
Wooden Footbridge	Each	1	\$500
Project Management			
Construction Quality Assurance	LS	1	\$5,000
Project Management & Coordination	LS	1	\$2,000
		TOTAL:	\$240,000.00

Summary Opinion of Probable Cost

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