Stormwater Management: Rain Garden at Grace Church

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Problem Statement

Storm runoff is a major concern for Grace Church due to the disturbances caused to the parking lot. The one existing storm drain in the northwest corner frequently gets plugged with leaves during heavy rainfall, which leads to flooding. The runoff makes driving hazardous and causes many problems for church patrons.

Our goal, in conjunction with two other design teams, is to reduce the amount of runoff reaching the drain, improve the quality of the drainage water, and create a solution which informs the community about good water management practices.

Criteria and Constraints

- Runoff flow should be reduced
- No parking spaces can be lost
- Must be applicable for funding from the Wabash River Enhancement Corporation
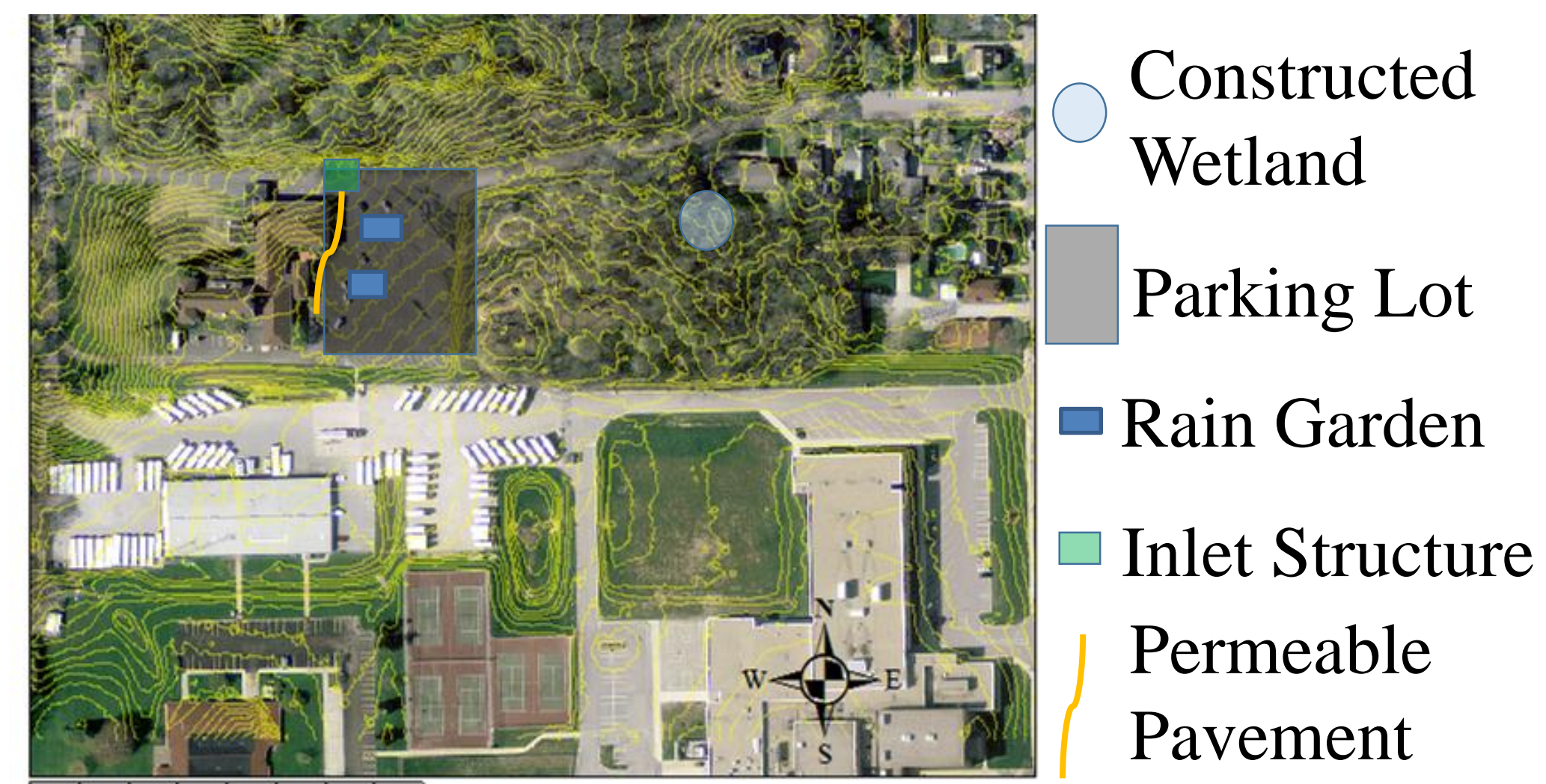- Should help educate community on best water management practices

- Constructed Wetland
- Parking Lot
- Rain Garden
- Inlet Structure
- Permeable Pavement

Figure 1: Overarching Site Map

Alternative Solutions

- Rain Gardens
- 2 ft x 195 ft
- Total area: 1170 ft^2
- Remove 64 parking spaces

Figure 2: Three Rain Gardens

- 2: 2 ft x 162 ft
- 2: 2 ft x 105 ft.
- Total Area: 1068 ft^2
- 0 parking spots removed.

Figure 3: Four Rain Gardens

Final Design

Figure 4: Final Design

- ADA Parking Space
- Rain Garden

- 2 rectangular rain gardens:
  - North - 27 ft x 18 ft
  - South - 27 ft x 36 ft
- Curbs surrounding gardens are sloped to conform to slope of parking lot
  - Will help slow down water as it enters the garden.
- Base of the garden is level
  - Allows for maximum infiltration minimum erosion within the garden
- First six inches of designated garden area is a depression
  - Serves as initial pooling area
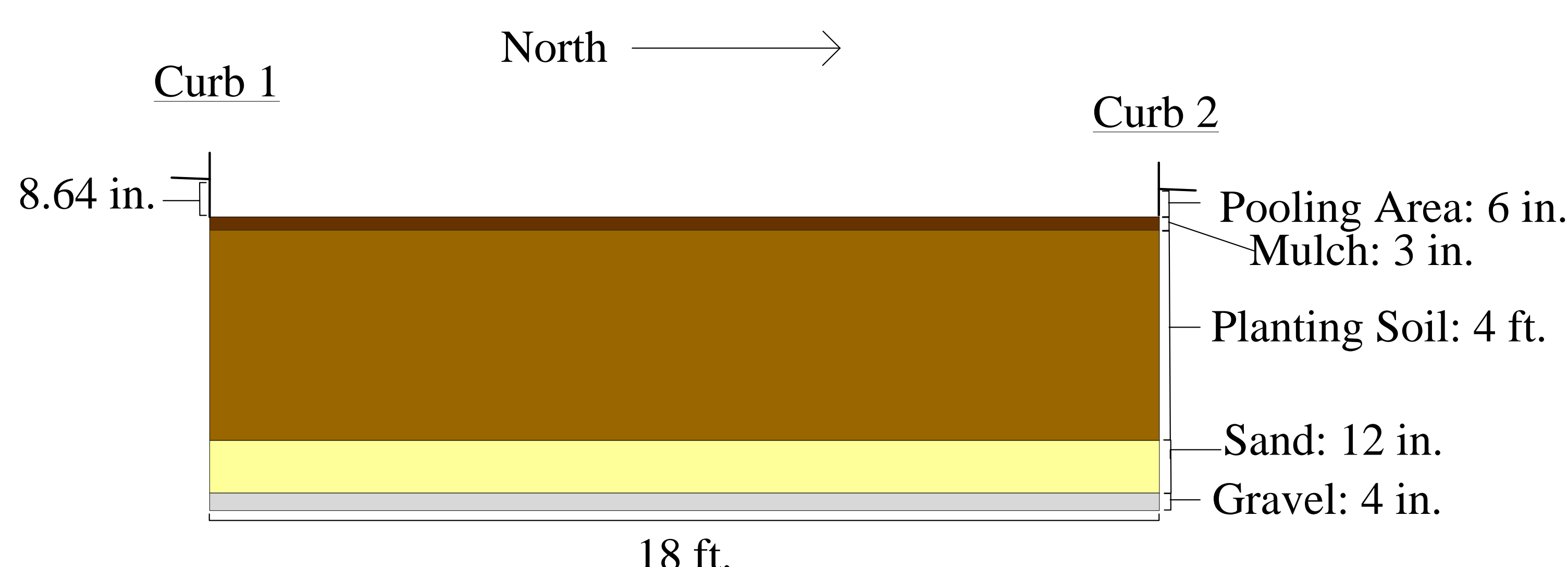- Plant layout is optimized for appropriate sun and moisture exposure

Figure 5: Rain Garden Cross-Section

- Inlet structure
  - Large triangular entry way centered on southern curb (Curb 1)
- Two outlet structures
  - Similar to inlet on far left and far right of northern side (Curb 2)
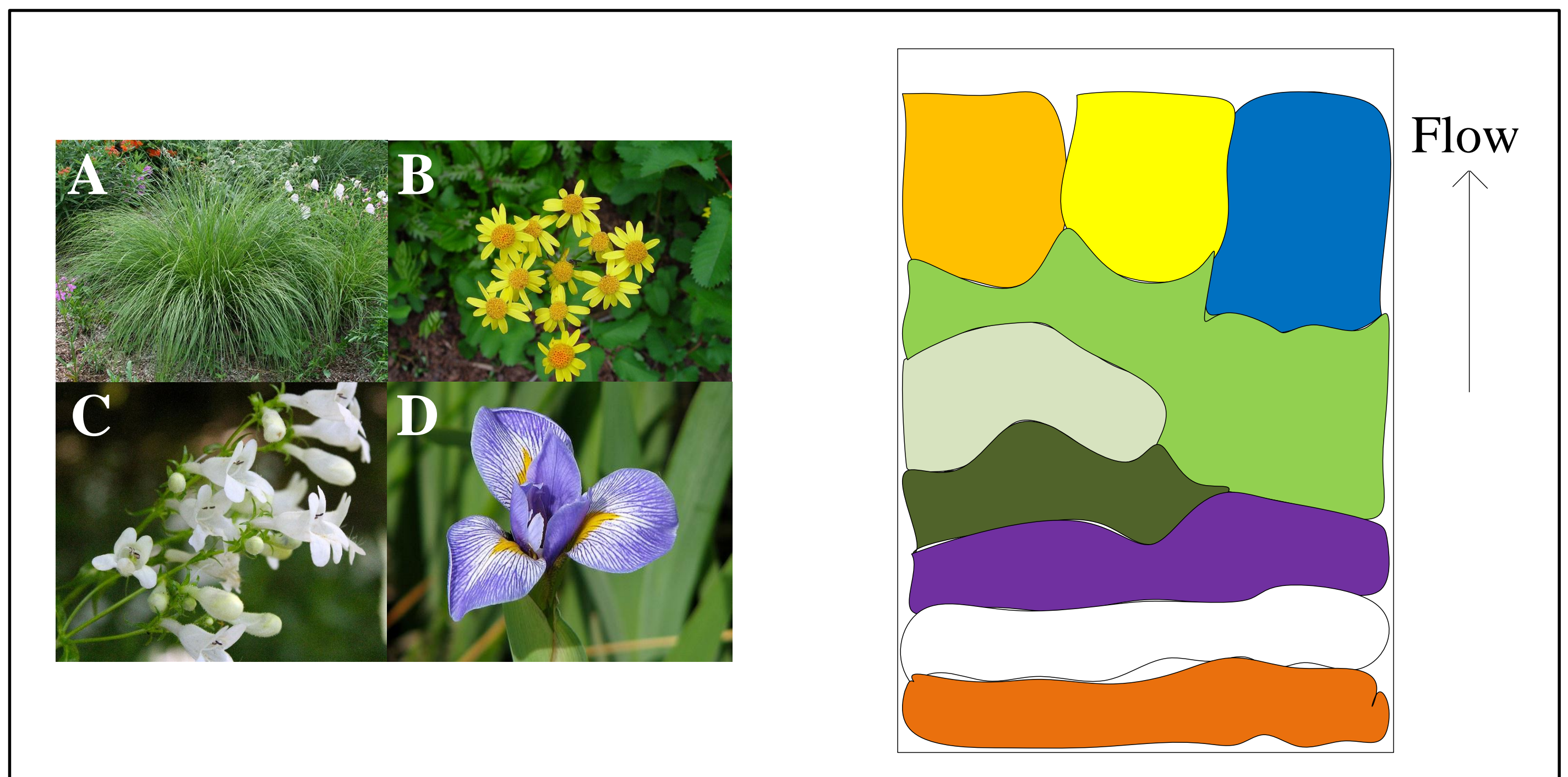- Both inlet and outlet structures will have rocks to help increase water turbulence

Figure 6: Rain Garden Vegetation

- Golden Alexanders
- Blue Flag Iris (D)
- Golden Ragwart (B)
- Mountain Mint
- June Grass
- Prairie Drop Seed (A)
- Foxglove Beardtongue (C)
- Common Spiderwort
- Wild Columbine

Results

	Rain Garden 1	Rain Garden 2
Area	18ft x 36ft (648ft^2)	27ft x 36ft (972ft^2)
Surface storage	2423 gallons	3635 gallons
Infiltration Volume	4847 gallons	7271 gallons

* Infiltration Rate is assumed to be 0.5in/hr

$$\left(Rain\ Garden\ Area\ (in^2)\right) * \left(6\ in + \left(\frac{0.5\ in}{hr} * 24hr\right)\right) = Total\ Capacity = 18{,}176\ gallons$$

Timeline

Activity	Aug-Dec	Jan-Feb	Mar-Apr	Apr-May
Project Scope	X			
Data Collection	X	X	X	
Calculations	X	X	X	
Alternative Solutions	X	X		
Determine Solution		X	X	
Submit Proposal			X	
Stakeholder Meetings	X	X	X	X
Write Design Report	X	X	X	X

Budget

Item	Cost
Percolation Test	$900
Asphalt Removal & Soil Excavation	$4,000
Soil Importing	$2,500
Purchasing Plants	$1,000
Parking Lot Re-striping	$1,000
Parking Lot Resealing	$1,000
Miscellaneous Cost	$1,600
Total	$12,000

Global and Societal Impact

- Encourage growth of local wildlife through use of native plants
- Implement educational program about native plants and local ecosystems for students at Sunnyside Middle School
- Improve local water quality and increase awareness of best management practices
- Prevent water damage to Church
- Increase accessibility of church services for patrons during precipitation events
- Promote the cost share program sponsored by the Wabash River Enhancement Corporation
- Prevent additional runoff from adversely affecting properties of surrounding residents

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