

Multi-Benefit Storm Water Designs

Environmental Architect

Benefit Analysis, Design Integration,
Impact Evaluation



What if your storm water design could do more than just capture or treat runoff?

During the design phases, there are often opportunities to consider and include other benefits.

Review each of the student design case studies from Cal Poly. Identify and list three benefits of each design that are not related to storm water capture or treatment in the following table:

Case Study 1	Case Study 2

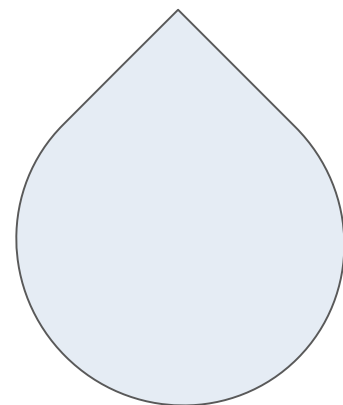
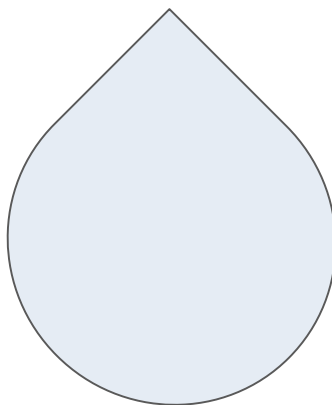
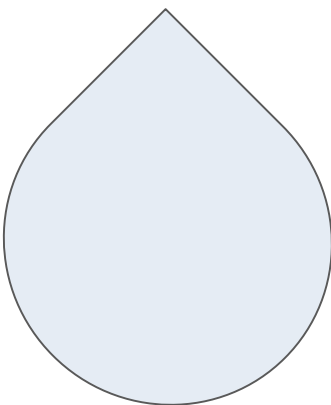
Design Modification	Description of Other Benefit

Now, review the proposed Mock Site GSI Design. What other benefits might you consider and include?

Designing with Community Input

Once groups have completed the Elevating Storm Water Design with a Charrette worksheet and shared their findings, fill in the following:

Most liked design features:

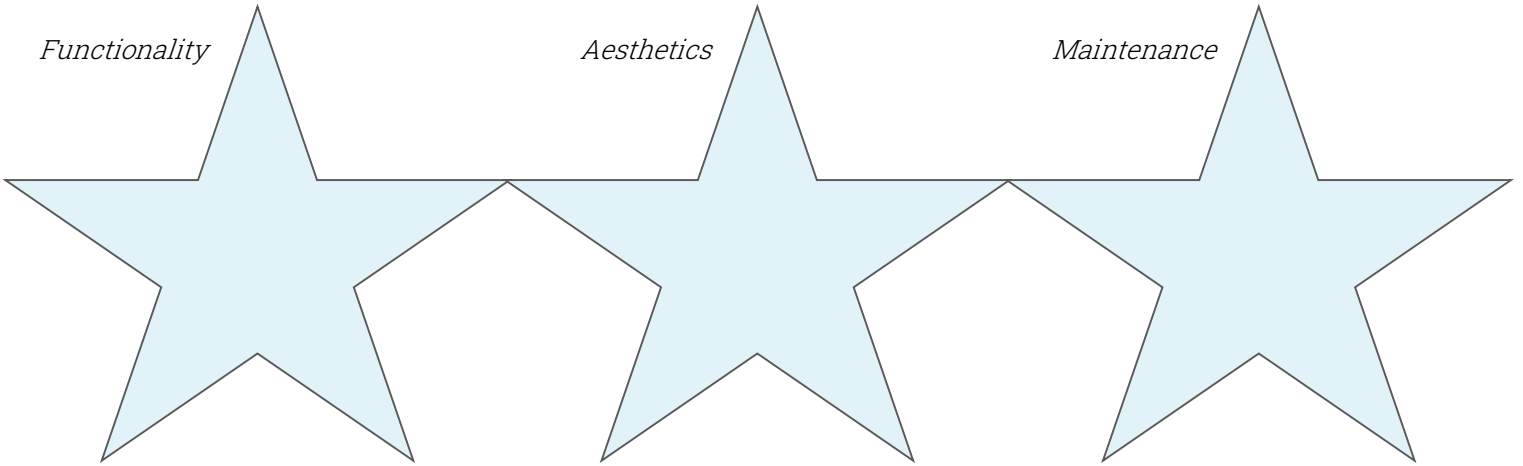


Best components of this design work relating to (write in stars):

Functionality

Aesthetics

Maintenance

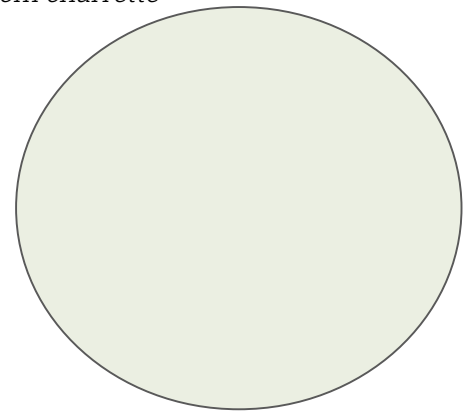
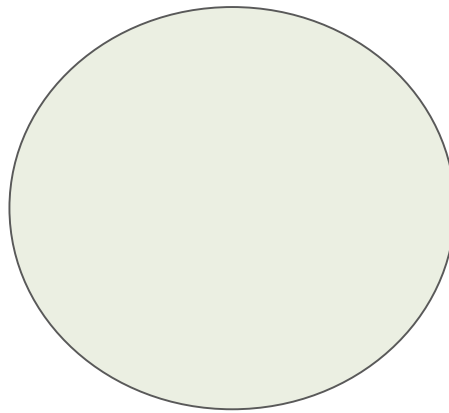
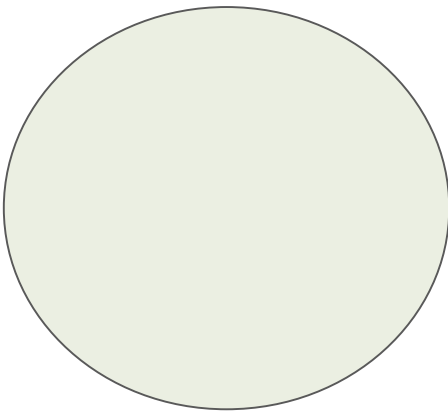


As a class, review the design modifications and other benefits to consider for the mock site design from what they listed in the Multi-Benefit Design worksheet, then fill in the following:

Modification

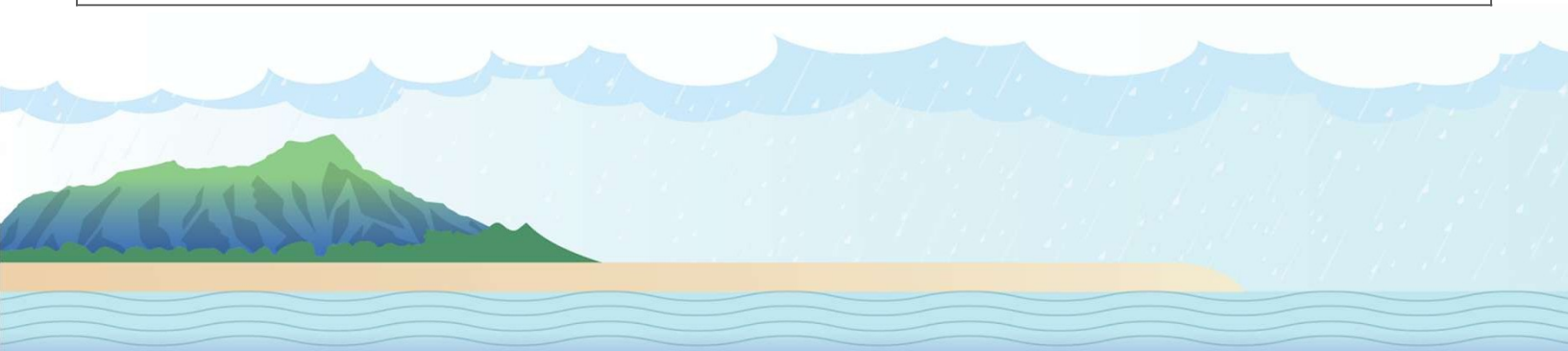
Benefits

*Alignments with input
from charrette*



As a class, decide on one or two modifications to include in your design based on best fit to provide benefits that the community finds desirable and highlight them above using stickers or colored markers.

Finally, discuss if there are other design modifications to consider to best fit the desires of the community based on the input from your charrette. List those here:



Elevating Storm Water Design with a Community Charrette

Environmental Architect

Community Engagement, Collaborative Brainstorming, Vision Development



What's a charrette? It's a lively design jam where creative minds unite to dream big! With community input at its core, participants collaborate to tackle challenges and create visionary solutions that reflect everyone's needs and aspirations for a brighter future.

Let's put this tool to work within the Mock Site. Using the potential GSI sites identified from the previous lesson, a proposed GSI design has been developed. Now it's time to get your input as a stakeholder.

STRATEGY #1 Input from different stakeholders on a common topic

On the Mock Site GSI Design provided, use stickers or markers to tag the design features you like, using the following colors to rank them:

- Blue - 1st place (Best Feature)
- Red - 2nd place (Good Feature)
- Green or Yellow - 3rd place (Liked Feature)

Analyze the results. Circle the areas with the most tags. Calculate their overall ranking using the following table.

Area	No. of Blue Tags (x 3)	No. of Red Tags (x 2)	No. of Green/Yellow Tags	TOTAL SCORE
1				
2				
3				
4				

STRATEGY #2 Input from the same group of stakeholders on different topics

Consider the area from the last activity that has the highest score. Assign someone to be a recorder who writes down on a separate paper what is shared. Then, as a group, discuss the following:

Functionality

- **Water Management Effectiveness:** How will the proposed feature manage storm water runoff? Are there specific metrics (e.g., volume, flow rate) to evaluate its performance?
- **Ecological Benefits:** What role does the feature play in supporting local ecosystems? Can it promote biodiversity or provide habitats for wildlife?
- **Integration with Existing Infrastructure:** How will the feature work with existing storm water systems? Are there any compatibility issues with current drainage systems or other GSI elements?

Aesthetics

- **Cultural Relevance:** How can the design reflect local culture or history? Are there opportunities for public art or community expression?
- **User Experience:** How will the feature improve the experience for pedestrians and cyclists? Can it create a sense of place or attract people to the area?
- **Accessibility:** How can the feature be designed to be inclusive and accessible to all community members, including those with disabilities?

Maintenance

- **Maintenance Requirements:** What are the specific maintenance needs of the proposed feature? How often will tasks be required, and what will they entail?
- **Durability and Longevity:** How will the materials and design choices impact the durability of the feature? What measures can ensure its longevity with minimal upkeep?
- **Training and Labor:** Who will perform maintenance duties? Is there a need for specialized training for personnel to care for this feature effectively?

Reflect on these charrette activities and discuss the following within your group:

- How did your charrette unfold? Were all participants actively engaged in the activities? What were some highlights of the discussions, and what challenges did you face?
- Based on the discussions, are there specific suggestions you would implement to improve your design? How can community input enhance the overall effectiveness of your project?
- If you were to conduct a charrette with your school or community, what changes would you consider? How would you ensure broader participation and richer discussions for a more impactful design process?

Determining GSI Design Impacts

What is the GSI Impact Calculator and how is it helpful?

This online calculator supports stakeholders in evaluating the benefits and costs of GSI. The online calculator is simple to use and automatically provides some important information to provide users with customizable outputs highlighting the multifaceted advantages of GSI, including flood risk reduction, heat mitigation, water quality improvement, and job creation. <https://gsiimpacthub.org/calculator/>

How do you use it?

- Begin by inputting details of the scenario or project:
 - Site Information
 - Storm Water Management Goals
 - BMP Selection
 - Benefit Specific Inputs
 - Economic Assumptions
- Then refine assumptions relating to:
 - BMPs and their estimated % of volume captured between selected BMP. This provides estimated BMP sizing and number needed to manage the volume accordingly.
 - Benefits to consider in the calculations.
 - Cost estimates
- Finally, explore the results:
 - Highlights: Return on Investment, Annual Benefits, and top 3 Co-Benefits
 - A summary of GSI Scenario Inputs
 - Present Value of Benefits to Costs
 - A pie chart of GSI Benefits
 - Benefits of different GSI practices
 - Additional GSI Scenario Outcomes



Though highly intuitive to use, the site includes a link to an easy to follow user guide. <https://gqr.sh/8dxN>

Practice using the calculator using the inputs provided in the table below.

Project & Site Information	Name: Mock Site GSI Design		Location: Honolulu, HI	Acres: 5	Medium Density: 100%	Population: 500	Homes: 50 %
storm water Management Goal	Rainfall (in): 28		Design (percentile): 80		Design (in): 0.5	% Impact: 10	
BMP Selection	Bioretention		Permeable Pavement			Cistern	
Benefit-Specific Inputs	No	Yes, 3	Yes	Yes, this project will enhance, 1, 5	Yes, this project will enhance, 0.25, 3	No	Yes
Economic Assumptions	No changes to default						
Refine GSI Portfolio	Bioretention: 64%		Permeable Pavement: 35%			Cistern: 1%	
Evaluate Benefits	Avoided Infrastructure Costs	Water Supply	Property Values	Habitat/Biodiversity	Heat Stress	Recreation	Water Quality
Review Costs	Yes	Capital: \$135,000			O&M: \$3,000		

Now complete the table below with the calculated outputs provided in the resulting GSI-Impact-Summary document.

Benefit per \$1 Invested (\$)	Annual Benefits (\$)	Top 3 Co-Benefits (Category, Value \$)			Average Annual Benefit GSI BMPs (\$)		
					Bioretention	Permeable Pavement	Cistern

To explore more, try altering one of the inputs and compare the impacts to the calculated impact.

Storm Patrol Project Design Presentation Template

Digital files of an 11"x17" format of the presentation template as previewed below, can be found online, and copied and shared with students to fill in relevant information for their project. <https://ggr/7u2d>



PROJECT TITLE

AERIAL MAP WITH PROJECT SITE OUTLINE	PROJECT SITE DESIGN MAP	LIST LANDSCAPE PERFORMANCE GOALS	SITE LOCATION DETAILS
			• Total Square Footage • Square Footage of Individual Surfaces • Drainage Area (square footage of landscape that create a contributory watershed for your project) • Any existing conditions for the Environmental or Social Metrics

Design Impacts

ROI		Annual Benefits		Top 3 Co-Benefits		
GSI/BMP 1 (Ex: Rain garden)	Present Value (\$\$)	Average Annual Benefit (\$\$)	Benefit per unit (\$\$)	Added Benefit Type 1 (Ex: Recreation)	Outcome 1 (User Days)	Outcome 2
				Added Benefit Type 2 (Ex: Heat Island Reduction)	Outcome 1 (Deaths)	Outcome 2
GSI/BMP (Ex: Cistern)	Present Value (\$\$)	Average Annual Benefit (\$\$)	Benefit per unit (\$\$)	Added Benefit Type 3	Outcome 1	Outcome 2
				Added Benefit Type 4	Outcome 1	Outcome 2