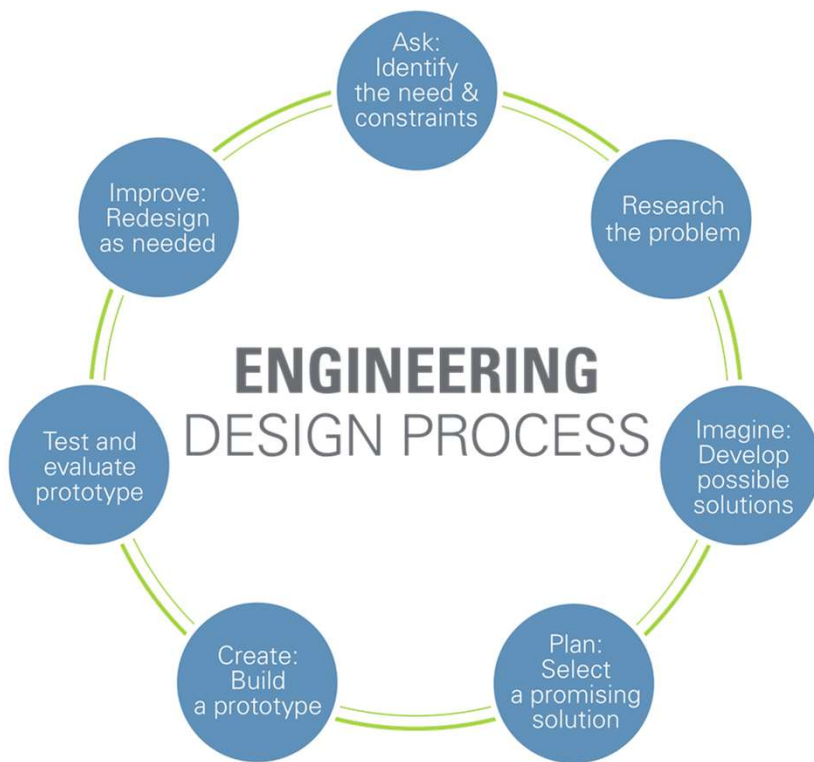


Measuring Trash Volume

Environmental Engineer Skills

Problem Identification, Site Analysis,
Spatial Reasoning



The first step in the Engineering Design process is to identify the need and constraints. Curtailing street litter to improve the quality and function of storm water systems is an increasingly important issue.

Learn how to estimate the volume of waste your site or community generates. By learning how to calculate volume and track garbage output, you'll see how thoughtful engineering can play a role in managing trash before it pollutes our waterways.

NOTE In making determinations in the step below, consider asking site maintenance staff or making your own observations or best guesses.

Part 1: Estimating Waste Volume

Typical Dumpster Volume (Cubic Yards, CY)	Typical Fill Level	Typical Service Frequency	Typical Monthly Waste Volume	Total Waste Volume: (CY per month)
[Length (7 ft) × Width (5 ft) × Height (6 ft)] ÷ 3	Between 50 and 75% (select average and convert to decimal)	Semi-weekly (fill in number of times a week below)	Calculate number weeks in a month (fill in result below)	Multiply (x) the four columns to the left and enter results below

Part 2: What's In Our Waste?

Based on the breakdown of waste categories, calculate how many cubic yards of each category your site throws away.

Did You Know?

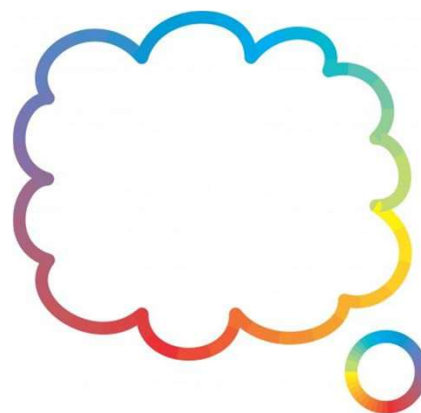
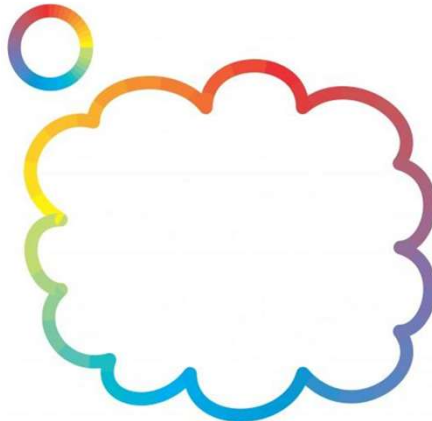
Litter is improperly discarded waste.

Whereas, trash is man made litter.

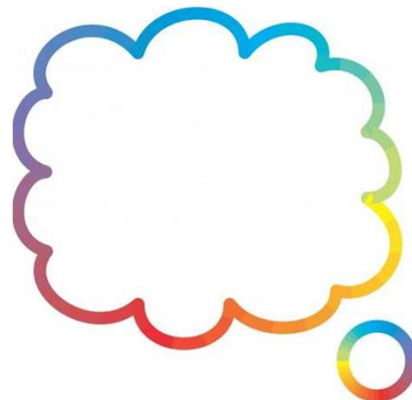
Material Category	Percent of Total Waste	Cubic Yards
Paper and Paperboard	23.1%	
Glass	4.2%	
Metals	8.8%	
Plastics	12.2%	
Rubber and Leather	3.1%	
Textiles	5.8%	
Wood	6.2%	
Food Waste	21.6%	
Yard Trimmings / Green Waste	12.1%	
Other Inorganic Waste	1.4%	
Other	1.5%	

Part 3: Reflection Questions

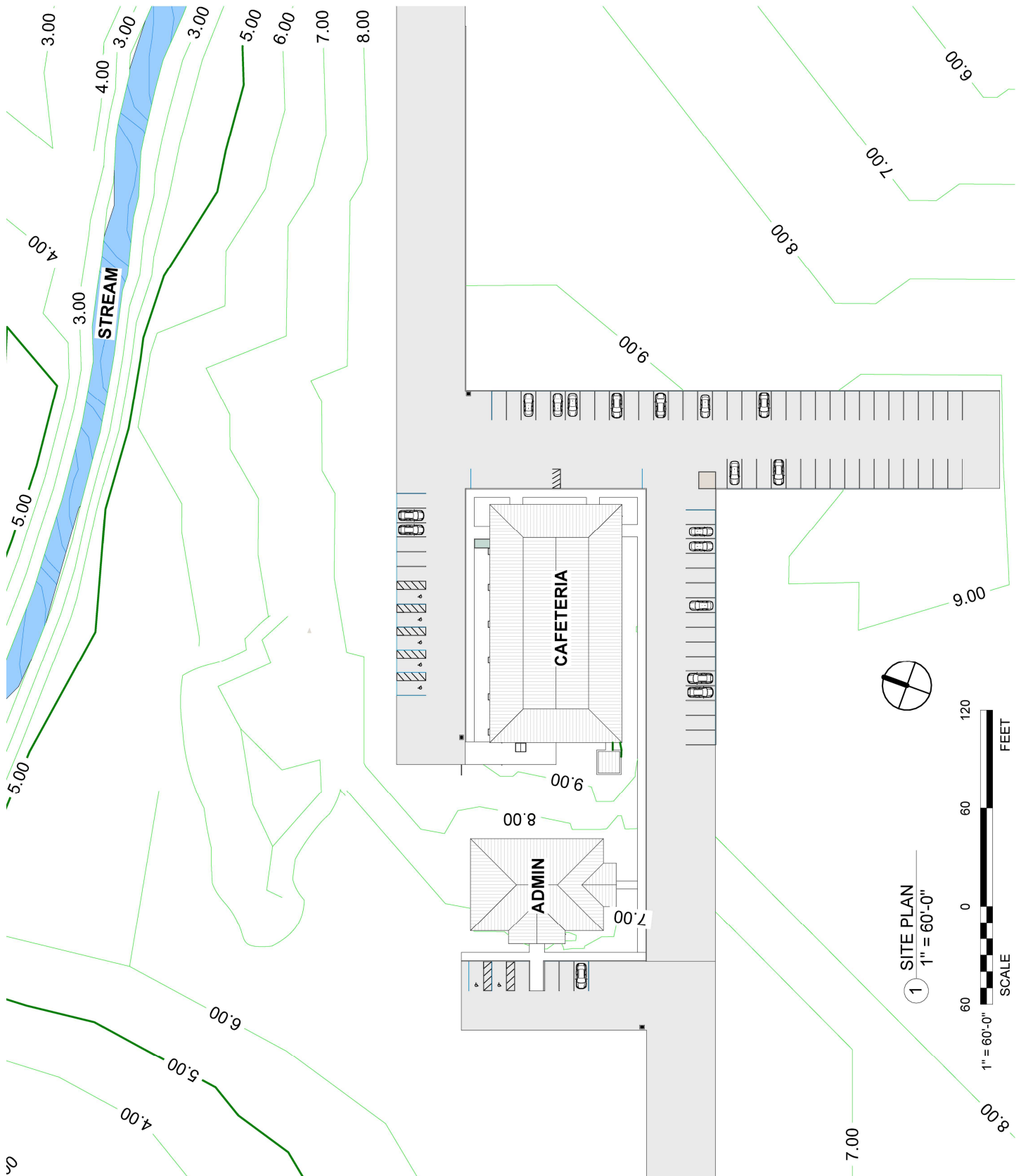
1. Mark on your *Mock Site SWPPP Map* a * or identify on your site where trash is generated. Assess and notate the presence and amount of receptacles to contain generated waste.
2. Brainstorm issues to consider regarding the maintenance of these receptacles. Enter your top three concerns in the thought bubbles below:



3. Mark on your mock site map a  or identify on your site where loose trash travels when it is raining.
4. Brainstorm some solutions to prevent loose trash from entering the site's storm drain system or nearby stream. Enter your top ideas in the thought bubbles below:



Mock Site SWPPP Map



Students should use completed map from Lesson 2, if available.

Exploring Trash Capture Technologies

Environmental Engineer Skills

Analytical Thinking, Research & Data Analysis, Project Planning & Evaluation



Now it's time in the design process to explore solutions!

In this activity, you'll learn about Trash Capture Technologies. You'll be assigned to a station that includes information about devices in one of three main categories:

- Inlet Devices
- In-Line Devices
- Open Water Devices

Your team is responsible for learning about the devices at their station, becoming "experts" that can "sell" the technology to the class to choose it for different project scenarios.

Become the Expert!

As you review the information sheets for the devices at your assigned station, use the criteria list below to decide which criteria is a Superpower (Pro) and which is a Weakness (Con) for each device and fill in the table below.

Cost: Amount of funding required to install and use the device. This includes the price of various device parts, equipment cost to install the device, and construction costs.

Efficiency: How well does the device capture trash? Consider the amount and types of trash the device can trap.

Accessibility: How easy is it to reach the device for inspections, cleaning, and/or repairs?

Maintenance/Repair: How often does the device require cleaning, servicing, or fixing? Is the maintenance and/or repair difficult to conduct?

Environmental Impact: How does the device affect the surrounding environment, including water quality and overall ecosystem.

Device Name	Strength (Pro)	Weakness (Con)

Operation: Trash Capture!

Trash Capture Engineering Challenge

Environmental Engineer Skills

Problem Solving, Collaboration & Communication, Project Management



Throughout this lesson, we have explored how much trash your site generates, considered how long types of trash take to break down, and learned about the three main types of trash capture technologies used within the storm water industry. You'll continue the design process in this worksheet by combining what we've learned to plan your own trash capture device!

Imagine you were working with your site's janitor or facilities team: What would they need to know to help keep your design working over time?

Part 1: Research Existing Trash Capture Technologies

Review the descriptions and photos of the various trash capture technologies provided. Research and review photos and videos of each type of device in action. Think about how each device works, what materials it's made from, what it takes to maintain them, safety concerns (e.g., large storms), etc. Also consider how much space each device takes up and how much trash is removed from the device over time. A few example considerations are listed below:

- Inlet Devices - curb inlet covers, screen baskets
 - Some inlet screens flip down to cover the inlet. Where might this type of inlet screen need to fit? What if your site does not have curb inlets - would this type of device still be useful?
- End-of-Pipe Devices - netting systems, linear radial collectors
 - End-of-pipe netting can range in size. Large end-of-pipe netting might need a crane to lift it out. Can your site or neighborhood have a crane in it? Who would need to operate it?
- Open Water Devices - floating litter booms
 - How and where would a floating litter boom be anchored? Will this device capture all trash, or only the floatables on top of the water?

Part 2: Design Your Trash Capture Solution

Let's design your trash capture device. Working in teams, select your device type and then work through the table below to plan and explain your design.

1. Select a category and then specify which type of device you will design

- ☐ Inlet Device _____
- ☐ End-of-pipe Device _____
- ☐ Open Water Device _____

Design Factor	Explanation
What kind of trash will it capture? (Plastic, food wrappers, microplastics, etc.)	
How much trash does it need to hold? (volume)	
Where will it be installed? (e.g., inlet, channel, stream)	
What materials will it be made from?	
How will it stay in place or float?	
How will trash be removed from it?	
How often will it need maintenance?	
What safety concerns may come up? (e.g., large storms, heavy machinery, etc.)	

2. **Sketch or describe your design:** *Include features like nets, arms, floatation, ramps, scoops, etc.*
(Use this space or attach another sheet)

Part 3: Compare & Reflect

1. Which method is more feasible in your community and why?
2. What would be challenging about building or installing this device in your community?
3. How could you improve your design with more time, materials, or input from others?