



**Step 4:** Identify every impervious surface you see. Name them out loud.

**Step 5:** Watch water hit impervious surfaces, collect and move. Notice how fast it travels.

**Step 6:** If you are looking at a roof, check out the gutters. If water flows into a gutter that leads underground, determine where the water goes to next. (It may go into the stormwater system which oftentimes bypasses water treatment and dumps directly into a nearby waterway).

**Step 7:** Notice where the water soaks in. (Pervious surfaces) Trees, grass, shrubs, and weeds all help capture stormwater, although some, like trees, capture more than others, such as lawns.

**Step 8:** Notice what gets picked up and moved: trash, oil, sediments, etc. Think about where the water will flow to next.

**Step 9:** Look closer. Find where water puddles instead of infiltrating the soil.

**Step 10:** Find evidence of erosion.

▲ **Figure 1.** Evidence of erosion at a construction site.



▲ **Figure 2.** An eroding trail

**Step 11:** Look for evidence of deposition (piles of sand, pebbles, trash).

▲ **Figure 3.** Deposition (of eroded materials) at a construction site.



# Stormwater

Now that you know how to read the clues that reveal how water moves in our built landscapes, let's continue with an investigation.

## Investigate!

Here is the question we invite you to research: To what extent does your home contribute to stormwater runoff?

The systematic, thoughtful steps you follow to answer the question is your Procedure:

- ▲ Get a pencil and an electronic gadget.
- ▲ Determine what impermeable surface(s) you will measure in addition to the building(s). Is there a sidewalk, a driveway, or a parking lot? You can measure them as well.
- ▲ There are three options for collecting measurements: low tech, medium tech, and high tech. You can check your accuracy by doing more than one.

### **Option 1- Low Tech:**

**Step 1:** Grab your measuring tape and go outside. Measure the length and width of each impervious surface to determine the impervious surface area.

**Step 2:** Record measurements in **CHART 2**. (round measurements to the nearest whole foot)

**Step 3:** Add all measurements together and record the **total area** at the bottom of **CHART 2**.

**Step 4:** Transfer the total square feet of area to **CHART 3**.

*TIP:* Measuring irregular shapes? Make them into standard shapes like squares, rectangles, and triangles to make calculating the area easier.

### **Here are a few equations to help you find the area of different shapes:**

Area of a rectangle

$L \times W$  (Length x Width)

Area of a triangle

$\frac{1}{2} bh$  (b= base of triangle, h = height)

Area of a square

$L^2$

Area of a circle

$\pi \times r^2$  ( $\pi = \text{pi}$ ,  $r = \text{radius}$ )

## CHART 1: SAMPLE CHART

Impervious Surface Name	Dimensions	Area
Ex. NorthBay Gym	86 ft x 126 ft	10,836 sq ft
Ex. Triangular Gym Deck b = 16 ft, h = 95 ft	$\frac{1}{2}$ (16 ft x 95 ft)	760 sq ft
Total		

## CHART 2: YOUR IMPERVIOUS SURFACE DATA

Impervious Surface Name	Dimensions	Area

## Option 2 Medium Tech:

**Step 1:** Use the measuring tool on your phone to find the dimensions of impervious surfaces.

**Step 2:** Record the measurements **CHART 2**.

**Step 3:** Add them together and record the **total area** at the bottom of **CHART 2**.

**Step 4:** Transfer the total square feet of area to **CHART 3**.

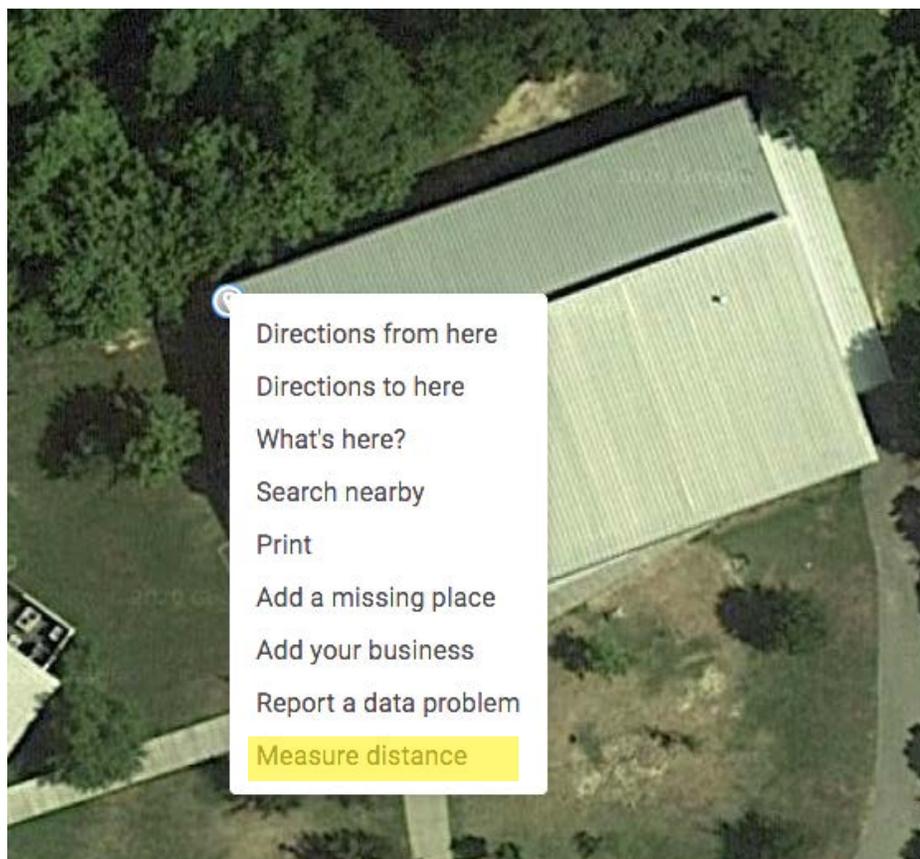
## Option 3 High Tech: Use GOOGLE Maps (<https://www.google.com/maps>)

**Step 1:** Find your residence on GOOGLE Maps. Our example uses NorthBay's Rocky Point Gym.

**Step 2:** Zoom in so you can clearly see the edges of impervious surfaces.

**Step 3:** Place cursor on a corner of a building. Right click, and at the bottom of the pop up menu you will see the words, "Measure distance."

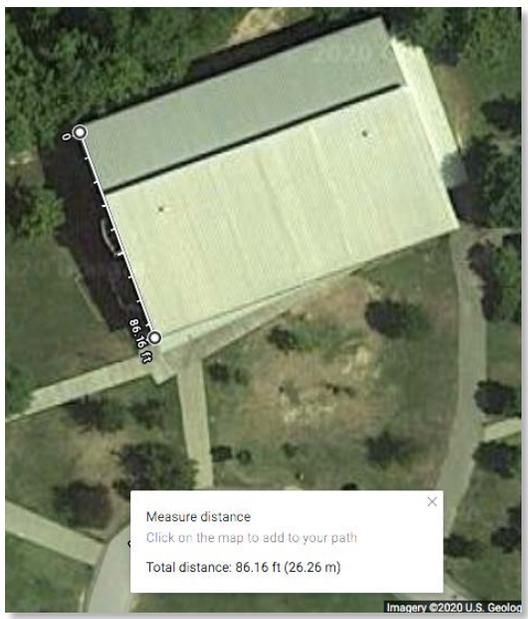
Figure 4.



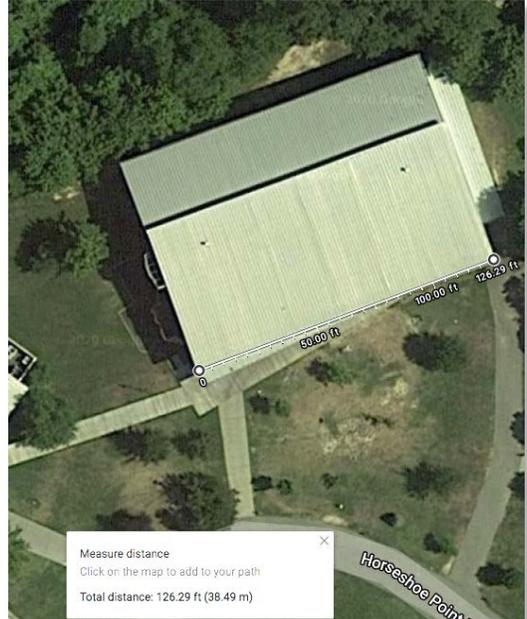
**Step 4:** Scroll down and select "Measure distance"

**Step 5:** Using your cursor, measure the length and width of the roof and enter them into **CHART 2**.

**Figure 5. Width of roof.**

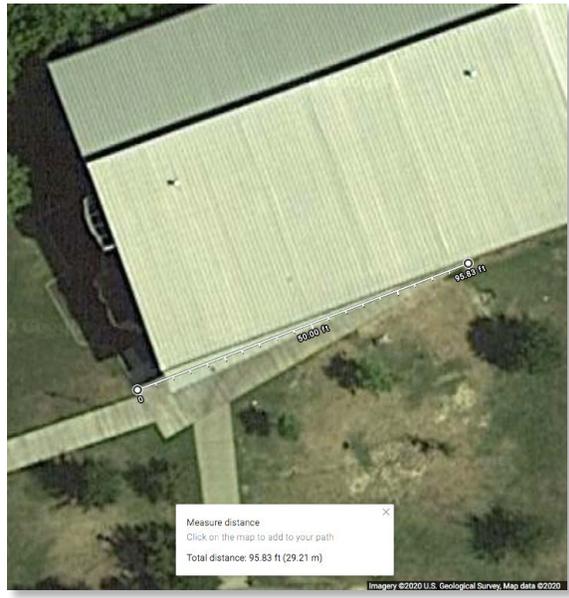


**Figure 6. Length of roof**

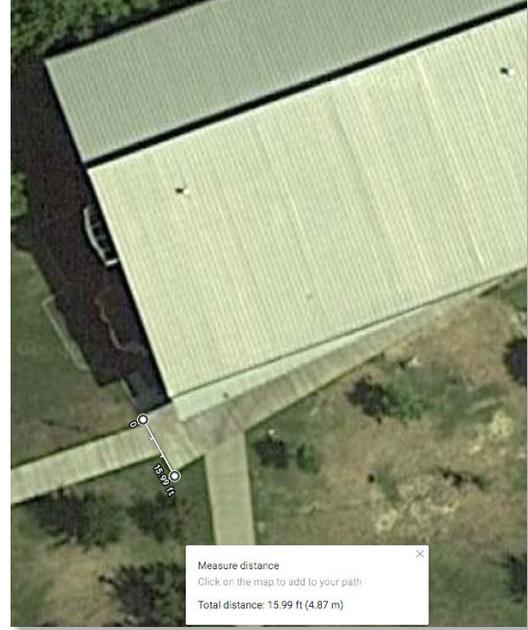


**Step 6:** Repeat steps for each impervious surface, making sure to record the results in **CHART**

**Figure 7. Height of triangular deck (h)**



**Figure 8. Base (b) of triangular deck**



**Step 7:** Calculate the area for each structure.

**Step 8:** Add them together and record the total area at the bottom of **CHART 2**.

**Step 9:** Transfer the total square feet of area to **CHART 3** to calculate the amount of stormwater that flows off the impervious surfaces where you live. Refer to the example if you need clarification.

## ANALYSIS

Stormwater Runoff Example: NorthBay's Rocky Point Gym and deck:	
Total Impervious Surfaces:	11,596 square feet
<b>Stormwater Calculation:</b>	
1. Convert square feet to square inches:	11, 596 sq feet x 144 sq inches = 1,669,824 square inches
2. Determine how many cubic inches of rain based on area and a <b>1.0 inch rainfall</b> :	1,669,824 square inches x 1.0 inch of rainfall = 1,669,824 cubic inches of rainfall
3. Convert cubic inches of rainfall to gallons of water:	1,669,824 cubic inches ÷ 231 cubic inches= 7,228 gallons
4. Multiply this result by 44 inches, the average amount of rain MD receives in a year <sup>1</sup> :	7,228 gallons x 44" = <b>318,061 gallons of water a year coming off of one roof and deck!</b>

### CHART 3: STORMWATER RUNOFF

TOTAL for Research Area:	
Total Impervious Surfaces:	_____ square feet
<b>Stormwater Calculation:</b>	
1. Convert square feet to square inches:	_____ sq feet x 144 sq inches = _____ square inches
2. Determine how many cubic inches of rain based on area and a <b>1.0 inch rainfall</b> :	_____ square inches x 1.0 inch of rainfall = _____ cubic inches of rainfall
3. Convert cubic inches of rainfall to gallons of water:	_____ cubic inches ÷ 231 cubic inches= _____ gallons of water
4. Multiply this result by 44 inches, the average amount of rain MD receives in a year <sup>2</sup> :	_____ <b>gallons x 44" = _____ gallons of stormwater runoff a year</b>
5. Share data in the google form and then click on LIVE link	<a href="#">Click here!</a>

The bottom line is that impervious surfaces in our built environments lead to a lot of water with nowhere to go. This is why we need you to be stormwater savvy! Stormwater runoff has significant impacts on our communities. Please take a few minutes to reflect on your communities, and then we will invite you to take some action.

<sup>1</sup>If you live in PA, the state receives on average 42" a rain a year.

<sup>2</sup>If you live in PA, the state receives on average 42" a rain a year.

## CONCLUSION

Now, please tell us what you found. Write your conclusion and include responses to:

▲ What did you do?

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▲ What did you discover?

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▲ What else do you wonder about stormwater runoff in your community?

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## Character Connection

▲ Describe your community. Who are the people, places, and things that make your community work?

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▲ Sometimes our community will experience difficult times. Describe a challenge your community has faced recently.

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▲ Just like we need to repair the damages from storm water runoff, how can we begin to repair damaged relationships in our community?

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# Stormwater



And now it is time for **ACTION!** What will you do?

Here are some *ideas!* Pick one or more, do it (or them), then tell us about it by emailing us at: [nbmedia@northbayadventure.org](mailto:nbmedia@northbayadventure.org), follow us on social media, & #NorthBayEducation your posts.



- ▲ **Teach people about stormwater runoff**
- ▲ **Replace a patch of lawn with native plants (conservation plantings) to absorb more runoff**
  - a. [National Wildlife Federation Native Plant Finder](#) [BETA]
  - b. [Native Plant Suppliers](#)
  - c. [Chesapeake Bay Watershed Native Plants](#)
- ▲ **Plant native trees (native plants and trees help prevent stormwater runoff and provide habitat for birds, bugs, frogs, salamanders, and mammals. And, they are beautiful!)**
- ▲ **Join a tree planting in your area**
- ▲ **Learn more about green infrastructure in your community: rain gardens, pervious pavers, rain barrels, conservation plantings, green roofs, swales, [curbside rain gardens](#) etc.**
- ▲ **Join a local community group that is installing green infrastructure projects. (Be sure green infrastructure experts are on the team.)**
- ▲ **Create a walking/biking tour of green infrastructure projects in your community to spread awareness.**



Click to watch: [Stormwater Video Wrap Up](#)