S17 48-305
Water Strategies
03/22/17

Exercise #1

Let's assume you want to collect all the precipitation that falls on a given day and store this water for use on-site or future release at later time. How much water will you collect?

Harvested water (gal) =
catchment area (SF) x runoff coefficient (var.) x .623 conversion factor x depth (in) x safety factor (var.)

For our region, NOAA defines a 50-year storm as 4.37 inches in a 24-hour period. Use the following table to calculate the volume of stormwater that would be collected on your site **IN ITS CURRENT STATE** during a 50-year storm:

Catchment Type	Area	Run.Coef.	C.F.	Depth (in)	Safety	Harvest (gal)
Roof		0.85	0.623		1	
Concrete/Asphalt		0.95	0.623		1	
Gravel		0.7	0.623		1	
Flat Soil w/ Veg.		0.75	0.623		1	
Flat Lawn		0.15	0.623		1	
					TOTAL	

Assuming the use of a cistern that has 8'-0" of interior clear height, what size cistern is required by the three scenarios above? Express your answers in both cubic ft and SF.

According to NOAA's climate normals, Pittsburgh's driest month is February, when the city receives 2.39" of precipitation. Use the following table to calculate the volume of stormwater that would be collected on your site **IN ITS CURRENT STATE** during February:

Catchment Type	Area	Run.Coef.	C.F.	Depth (in)	Safety	Harvest (gal)
Roof		0.85	0.623		1	
Concrete/Asphalt		0.95	0.623		1	
Gravel		0.7	0.623		1	
Flat Soil w/ Veg.		0.75	0.623		1	
Flat Lawn		0.15	0.623		1	
					TOTAL	

Exercise #2

Water use on-site is driven by multiple factors including human use, mechanical consumption, and irrigation. Demand can be reduced by using water-conserving systems and strategies in any of these categories. Consumption can further be reduced by reuse and recycling on-site. For the sake of this assignment, we'd like to establish whether your site and design would provide enough harvested water to sustain a net-zero water building based on typical California middle school consumption data from the Pacific Institute (http://pacinst.org/wp-content/uploads/2013/02/appendix_e3.pdf) and irrigation data from the Penn State Extension service.

Note: How many days is your school fully occupied per month?

CA Middle School Consumption	Occupants, Area	Consumption	Unit	Frequency	Gallons/day
Irrigation	4,500 SF	0.089	gal/SF	1	
Toilet	210	3	gpf	2.11	
Urinal	210	1.6	gpf	1.01	
Faucet Use	210	0.11	gpf	3.12	
Kitchen	210	9.91	gal/meal	0.4	
Cooling & Mech	210	4	gal/day	1	
				TOTAL/Day	
				TOTAL/Month	

Based on the consumption values assumed above, in the driest month of the school year, could your **UNDEVELOPED** site and design harvest adequate water to meet the monthly demand given the assumptions and calculations above?

Exercise #3

Now what about your project? Taking dimensions from your current site / roof plan, use the following table to calculate the volume of stormwater that would be collected during a 50-year storm **IF YOUR PROJECT WERE BUILT**:

Catchment Type	Area	Run.Coef.	C.F.	Depth (in)	Safety	Harvest (gal)
Roof		0.85	0.623		1	
Concrete/Asphalt		0.95	0.623		1	
Gravel		0.7	0.623		1	
Flat Soil w/ Veg.		0.75	0.623		1	
Flat Lawn		0.15	0.623		1	
					TOTAL	

Assuming the use of a cistern that has 8’-0” of interior clear height, what size cistern is required by the three scenarios above? Express your answers in both cubic ft and SF.

According to NOAA’s climate normals, Pittsburgh’s driest month is February, when the city receives 2.39” of precipitation. Use the following table to calculate the volume of stormwater that would be collected on your site **WITH YOUR DESIGN** during February:

Catchment Type	Area	Run.Coef.	C.F.	Depth (in)	Safety	Harvest (gal)
Roof		0.85	0.623		1	
Concrete/Asphalt		0.95	0.623		1	
Gravel		0.7	0.623		1	
Flat Soil w/ Veg.		0.75	0.623		1	
Flat Lawn		0.15	0.623		1	
					TOTAL	

Based on the consumption values assumed above and your answers to Exercise #2, in the driest month of the school year, could your **DEVELOPED** site and design harvest adequate water to meet the monthly demand given the assumptions and calculations above?

Exercise #4

If your project is not is not net zero per Exercise #3, no worries! What about if faucets and kitchen uses were omitted (the Frick approach)?

CA Middle School Consumption	Occupants, Area	Consumption	Unit	Frequency	Gallons/day
Irrigation	4,500 SF	0.089	gal/SF	1	
Toilet	210	3	gpf	2.11	
Urinal	210	1.6	gpf	1.01	
Faucet Use	210	**0**	gpf	3.12	
Kitchen	210	**0**	gal/meal	0.4	
Cooling & Mech	210	4	gal/day	1	
				TOTAL/Day	
				TOTAL/Month	

What else can you do to try to achieve net zero water?

Iterate!

CA Middle School Consumption	Occupants, Area	Consumption	Unit	Frequency	Gallons/day
Irrigation (drought tolerant?)	4,500 SF		gal/SF	1	
Toilet (low-flow?)	210		gpf	2.11	
Urinal (waterless?)	210		gpf	1.01	
Faucet Use (low-flow?)	210		gpf	3.12	
Kitchen	210		gal/meal	0.4	
Cooling & Mech (non-H20?)	210		gal/day	1	
				TOTAL/Day	
				TOTAL/Month	