

# Documentation

Learning in Museums, Spring 2020

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## Overview

The Anthropocene topic for our final deliverable was on water quality. Specifically, our group narrowed the topic down to focus on the water system. To educate our users about the water system, our group designed a multi-page activity booklet, H<sub>2</sub>OME, aimed at children from grades three to five. The activity booklet consists of five activities, each one focusing on a different component of the water system. The learning goals of the activity booklet are:

1. To help visitors develop an understanding and awareness of domestic water use, amounts of water in everyday activities, green infrastructures, and water sources across Pittsburgh.
2. To generate feelings of confidence in their water knowledge, such as identifying water sources, water contaminants, water infrastructures, and green infrastructures.
3. To enable changes in users' cognitions in ways such that they are more aware of their water usage and are motivated to apply their new knowledge in ways that promote better water quality.

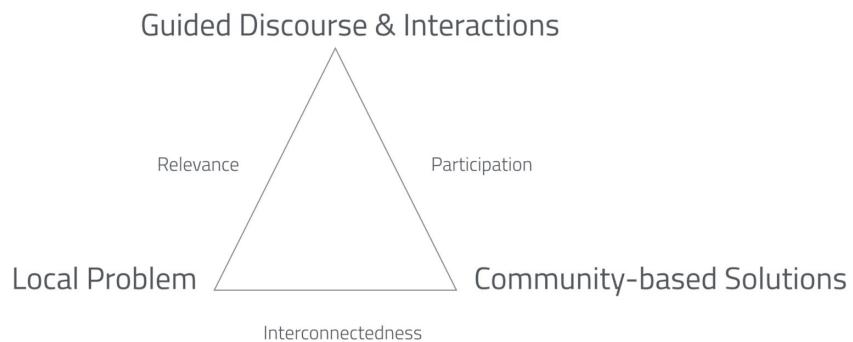


Figure 1. CUSP Theory of Action

While designing H<sub>2</sub>OME, we used CUSP Theory of Action for guidance. First, this booklet frames relevance because it depicts domestic water use in users' homes and focuses on Pittsburgh's water sources. Second, this booklet encourages participation because the activities are not only interactive, but also conversation starters. Third, this booklet is interconnected because it demonstrates how domestic water use (system 1) is closely linked to water misuse (system 2).

## Learning and Design Research Synthesis

Through our visits to the museum, we realized most of the exhibitions were centered around families with young children. Therefore, we believed designing an exhibit or activity kit for children was appropriate. In addition, through our observational studies at the museum's Discovery Basecamp exhibit, we took note that children were attracted to artful, open-ended exhibitions. Next, through our PMM studies, we realized that visitors had a shallow depth and breadth knowledge about water quality. Lastly, due to the current COVID-19 quarantine

situation in Pittsburgh, we were interested in creating a project that would be of interest to families looking for at-home educational activities. Taking these into account, we decided we would create an eye-catching and scaffolded interactive activity.

While brainstorming ideas, we came across a physics coloring activity book called "Color Me Physics". The booklet featured many activities, including a find-the-hidden-object game, a maze, a crossword puzzle, and a cut-out activity. This inspired us to create a similar activity booklet, except ours would pertain to water systems.

We took various features of classic activity books, such as coloring, crossword puzzles, and mazes and created our own version, taking education and design into consideration. The elements within the booklet were hand drawn in a style that would be appealing for our chosen age group in order to grasp and maintain the attention of the users, while keeping our goal for educating the user on Pittsburgh's water system and how the user can affect it. In the end, we came up with 5 different activities, a simple addition and multiplication based activity, a maze, an "I spy" activity, a crossword puzzle, and a cut out "design for yourself" activity.

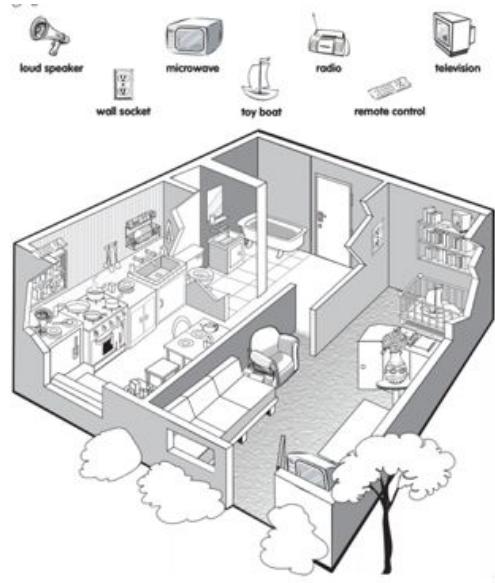


Figure 2. One activity in the physics booklet to find Tesla's inventions  
(LINK: <http://www.physicscentral.org/experiment/colormephysics/activitybook.cfm>)

## Exhibit Prototyping Process

In preparation for our field tests, we printed four copies of the prototype booklet. Because our project is targeted at children and is purely analog, we asked professors to help us recruit families in Pittsburgh with children. Through this process, we were able to get in-depth

feedback from one family. A mother and her seven-year old son living in Dormont were given a physical copy of the booklet and interviewed after they worked on it. Because we had just one data set ( $N=1$ ), we treated this prototyping session as a case study and derived insights from it, instead of final conclusions.

The interview was conducted via Zoom, and it was predominantly between us and the mother, though the child interjected a few times. We asked questions that measured three broad categories:

- **Usability** (ie. how clear were the instructions on the booklet?)
- **Engagement** (ie. how engaged was your child for the [activity name] activity?)
- **Learning** (ie. did anything from the booklet surprise you or your child?)

After the interview, we transcribed the discussion, using Otter.ai. We analyzed the interview by coding important ideas and identifying core themes using a bottom-up approach. We also asked the mother to send photos of her son's work for us to analyze. See [Appendix A](#) for the full transcription and coding.

One major theme that we identified was the difficulty of the content. Initially, we believed H<sub>2</sub>OME was appropriate for children ages 5 to 10. However, we did not realize children did not learn multiplication before they were 9 years old, which is in grade three. Hence, portions of the activity booklet that required multiplication were impossible to complete alone, particularly for our 7 year old participant (Figure 3). Through this insight, we decided to raise the target user range to 8 to 11 years old, or grades 3-5..

Another difficult section of the activity booklet was Water Beyond Sight, which is the crossword puzzle with definitions of infrastructure terms. When we asked the child if he knew what some of the green infrastructure terms meant (ie. bioswale, permeable street, green roof), he constantly replied with "what is that?". Even the mother confessed she did not know what most of the words were. Thus, this depicts the potential problem of expert blind spot, in which we forgot how difficult the content was initially. However, we believe more tests must be done in order to determine whether a crossword puzzle is simply not engaging or does not alleviate the issue of difficulty.

We considered Aqua City, the activity booklet's fifth activity, as an informal, summative learning assessment. If the user learned from the activity booklet, it would materialize as a high score on the activity's score sheet. However, our participant only scored a point of one on the activity (Figure 5). One potential explanation for this is that the child did not complete the activity booklet -- he rushed through it and skipped activity three (Water Beyond Sight). Another potential explanation is the *familiarity principle*. According to the mother, the son "just used the stuff that looked familiar." This suggests how the child deviated from the learning goal and preferred familiar objects. We believe more tests on older children must be done to confirm whether this will be a recurrent issue.

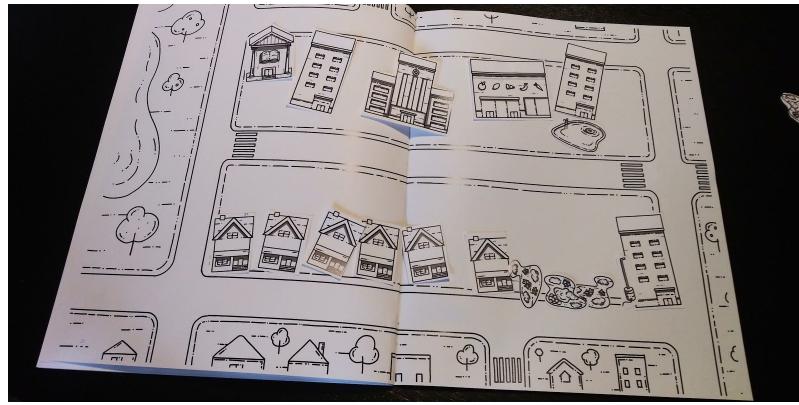


Figure 4. Participant's work on Aqua City

SCORE SHEET			
Try to complete the Aqua City activity without looking at these point values first, then use the Score Sheet to calculate the score of your water-conscious city. How did you do? What are ways you can improve your score? Feel free to rebuild your city, then recalculate your score!			
Component	Points	Your Quantity	Points Subtotal
Bioswale	+ 2	<input type="checkbox"/>	= <input type="checkbox"/>
Permeable Street Pavement	+ 2	<input type="checkbox"/>	= <input type="checkbox"/>
Rain Garden	+ 1	<input type="checkbox"/>	= <input type="checkbox"/>
Green Roof	+ 1	<input type="checkbox"/>	= <input type="checkbox"/>
Rain Barrel	+ 1	<input type="checkbox"/>	= <input type="checkbox"/>
Flower Garden	0	<input type="checkbox"/>	= <input type="checkbox"/>
Bench	0	<input type="checkbox"/>	= <input type="checkbox"/>
Car	-1	<input type="checkbox"/>	= <input type="checkbox"/>
Fish Pond	-1	<input type="checkbox"/>	= <input type="checkbox"/>
Lawn Sprinkler	-1	<input type="checkbox"/>	= <input type="checkbox"/>
Pool	-1	<input type="checkbox"/>	= <input type="checkbox"/>
Fountain	-2	<input type="checkbox"/>	= <input type="checkbox"/>
Are we multiplying by negative numbers? Too advanced		TOTAL SCORE	<input type="checkbox"/> 1

Figure 5. Participant's score sheet for Aqua City

Another change that we have made to our prototype was switching the order of Water Beyond Sight and Flush It! We did this because the terms defined in Water Beyond Sight seemed more relevant to the final activity (AquaCity). Overall, we believe we achieved most of the first and second learning goals. The mother and son were engaged and surprised by most of the content. They also stated that they had fun and really enjoyed the activities in the booklet, particularly the Bottling Your Water exercise. Although the child did not immediately behave in ways that promote better water quality, the mother stated that “this activity is a good start to make him think about water and how much water he wastes.”

## **Reflections**

This semester was marked by drastic changes. Nevertheless, we are very proud of H<sub>2</sub>OME and hope to see it someday inside the Carnegie Museum of Natural History.

Rather than the time it took to create the whole booklet, the time to develop the idea was the most time-consuming. Because we no longer had access to craft/fabrication tools and could only work remotely, coming up with a realistic project plan was difficult. One idea was to create an online mapping tool that mapped the user's water route from their neighborhood to Alcosan. Another idea was to create an app that measured how much water the user was using in a day. These ideas were scrapped because we felt a web-based approach did not play to our full strengths and was too arduous.

After we arrived at the idea of creating an activity booklet, we were more goal-driven and able to focus. In addition, having two architecture students in our group helped tremendously with team chemistry and work production. When we did complete the prototype of H<sub>2</sub>OME, however, getting participants was particularly challenging. Furthermore, sending the participants physical copies of the booklets was time-consuming and demanding -- Selena had to drive to the outskirts of Pittsburgh and drop off the booklet. To solve this, perhaps, we could have considered our target users and began the recruitment process earlier, or class deadlines could have been moved up to accommodate the time families needed to work on the booklet.

## **Museum Recommendations**

Although we have worked extensively on H<sub>2</sub>OME, there is always still room for improvement. As aforementioned, this activity booklet encompasses the three aspects of the CUSP Theory of Action, which are relevance, participation, and interconnectedness. Nevertheless, we believe that users may not strongly feel a sense of collective efficacy because this booklet does not visualize the impact of users' decisions. Furthermore, knowledge about green infrastructures is demonstrated throughout the activity booklet; however, procedures on how to acquire and promote these green infrastructures are not present. Thus, the museum should, perhaps, have an adjacent activity that visualizes the user's decisions and ideally have additional information on green infrastructures. It is important to note, however, these recommendations go beyond the scope of H<sub>2</sub>OME's purpose and are more targeted at adults.

Moreover, looking at direct recommendations to the museum, we believe it is important that the museum keeps in touch with the community, even during times of social distancing. While this is a suggestion from our review, we feel it is important to mention that it would be interesting if the museum were able to reach out with educational learning material

through handout newsletters or local museums and magazines. This is one of the core reasons we focused on creating a physical booklet that could be used at the comfort of one's home. Creating more booklets like these or even simple activity oriented newsletters, we believe, is a very thoughtful approach to helping out families fill their time in beneficial ways.

See [Appendix C](#) for full comments from reviewers.

## **Appendix A - Prototype Interview Transcription**

See next page!

Or go back to the [Table of Contents](#).

USABILITY : measure the quality of user's experience

LEARNING DESIGN : measure whether learning goals are met

CONTENT DESIGN : measure whether content is useful and usable

MATERIAL DESIGN : measure whether visuals and design of booklet are convenient

Don Lee 0:08

How long did it take you to complete the activity booklet?

Melissa Porter 3:20

We got as far as the city. I mean, we could have taken our time and make it last longer, but since we wanted to get it done for you guys, (I don't know) probably about an hour to do the whole thing. We did not get to the crossword puzzle, but we did pretty much everything else.

Don Lee 3:54

I see that you also sent me the photos of the cutout which is the Aqua City. How long did that activity specifically take you?

Melissa Porter 4:06

Yeah, that... he didn't work very long on that. What about setting up the city?

Donovan 4:12

Um, I started it today.

Melissa Porter 4:14

Yeah, he started on it. He didn't get a chance to do any coloring or anything like that, but it seems like it would be a fun activity--color and setup. I think (I don't know if you're able to), but it would have been easier for the parents, if the page was perforated. They could just rip it out instead of having to cut, but other than that, it looks like it's a fun activity. I did tell him about the score sheet at the beginning. He still didn't use most of the stuff, but I think it's not a bad idea to let them look at the score sheet at the beginning so they know what they're trying to do.

Don Lee 5:00

So our next question is how clear were the instructions on the booklet? Did Donovan have any trouble understanding anything?

Donovan 5:07

I had a little trouble finding out what this was.

Melissa Porter 5:14

Some of the pollutants aren't super clear in that picture. But the directions themselves were clear. We just made a note that-

Donovan 5:25

I had no idea what this was. I had no what this was. I had no idea what-

Melissa Porter 5:28

Like the picture of the **bandaid picture doesn't really seem like a band aid** (and the q tips, the gum, the hair...). Most of this stuff that wasn't labeled we had to look at the list on the next page, which seems like it's fine. I would say instead of saying if you need a hint look on the next page, I would say definitely look at the next page so you know what these things are because I didn't realize what they were without help.

Well, I just thought where it tells the kids to collect the pollutants at their house **might be dangerous** for little kids to like look for that kind of stuff. Maybe say to "just say find it" or maybe find it with your parents. I don't know if you're interested in changing the wording or anything but collecting it made me think okay, like all these little kids are going to go and get like poisons from their houses.

Don Lee 6:53

One comment that I saw on one of your photos was that the multiplications for negative numbers was too difficult.

Melissa Porter 7:05

I guess it's not... **multiplication in general he hasn't done yet**. I don't think they really do that till like, they're probably like eight or nine. But, I mean, I was able to do that beforehand.

Don Lee 7:20

I feel like we forgot at what age we learned multiplication because it's been so long.

Melissa Porter 7:27

What I really liked that one page where we had to figure out how much water we used in our house. But then I had to add all those like three digit numbers. So we did multiply and then add all those three digit numbers. So I pretty much did all the math on that. Maybe a 10 year old could probably do it.

Donovan 7:56

Yeah, I'm good at multiplying, just not good at multiplying by one.

Melissa Porter 8:00

But multiplying by one is the easiest one. So yeah, I'll have to teach you. So I mean, you could leave it in there, but it's just kind of for the older kids, or children should work with their parents.

Don Lee 8:29

Did Donovan focus mostly on the visual aspect of the activity booklet or did he look at the text?

Melissa Porter 8:40

More of the visual stuff. I mean, he is a pretty good reader, but **he did not really read this stuff**. I kind of just explained it to them. And I wanted to tell you guys on that very first page, you should change firstly

to just first because I don't think you need to say "firstly". What did you think about seeing about all the pictures and stuff that were in it?

Donovan 9:22

Well, the pictures are definitely... well, the water bottle pictures were very very clear.

Melissa Porter 9:31

Yeah, you liked the water bottle pictures.

Donovan 9:33

Very very clear. They look like soda bottles.

Melissa Porter 9:40

Yeah, that's just how water bottles look. On the page that has like the 189 and the 99 I don't know if you could probably just put the numbers and instead of putting all those bottles, but I mean it is it does really make an impact seeing all those models. So it just depends on if you're like not you're not trying to save paper.

Don Lee 10:05

Okay, so continuing on from that did anything from the booklet surprise you or your child?

Melissa Porter 10:11

How much water we use. We only have three people [in our house] and we we use pretty low amounts. The estimates of how much we use and was still a giant number.

Don Lee 10:26

Was there any activity that surprised you?

Melissa Porter 10:43

I liked the green infrastructure, that was stuff that I didn't know. He [Donovan] definitely didn't know. I don't know if you can go into more explanation... you do give the definitions of them on that one page for the Aquacity. I don't know that you need the pictures of them in the middle of the book there, and then not talk about them too later. Maybe you could just like put that all together. I don't know, the ordering with the booklet.

And I also wanted to say it'd be so much easier if this was on the centerfold. It was hard to set up the stuff and lay it flat because the book won't lay flat with the back. So like if you had the city straight on the center, they can really lay nicely and flat. You could like have them really color and glue it all and it would be an apartment, all on one page. If you could do that, that would be really nice. So like yeah, maybe have a couple things then do the city and then have a couple more things after it because it was challenging for him to set it up on with the paper flat.

Don Lee 12:01

So next we were wondering how engaged your child doniphon was for each activity. So maybe if you could give us like a one being not that engaged and five being very engaged. The first activity was the Bottling your water activity.

Melissa Porter 12:22

He was very engaged for that. It was the first one we did. He was like all excited and into it so I'd give it a five.

Don Lee 12:29

How about the Find-the-water activity?

Melissa Porter 12:37

That was the one with the picture? Yeah, he was still pretty engaged in that. And especially more whenever I turned the page and realized, "Oh, that's what these things are" because we weren't sure. I didn't look, even the parents probably aren't going to look at all the writing. Like I didn't realize, "Oh, look at this writing up in the corner, it says look on the next page for the answer". But I'd say he was probably probably five on that. We were trying to figure out what that was on the floor. But he was definitely engaged. It was a little tricky. We didn't get to the try it out at home yet. We're, but yeah, he was gonna walk around the house and look at the water features. We did not get to that page.

Don Lee 13:26

You said that Donovan didn't have the opportunity to try out the water on site, which is the crossword puzzle?

Melissa Porter 13:34

Yeah. I imagine he definitely would not able to do it. I would have had to probably look up some of the answers myself. That one's probably a little challenging for like five or six year olds. I don't know that he could have even read it, but he definitely wouldn't have known any of the answers. We would have to look for it [answers].

Don Lee 14:08

So do you think the high level of difficulty was what deterred Donovan from trying out the activity?

Melissa Porter 14:17

Yeah, yeah, this one because he not do the maze. He loves the maze and everything... but I mean some kids are going to be more reading the words and less visual... he [Donovan] was drawn to the ones that have pictures. So the one that was just a whole page of words, he wasn't engaged. We were like "we'll save that one and see if we have time for it" because I wasn't going to force him to do it. So then, yeah, the maze... he was like, a five on the maze. We did not get to do the flushing activity but I was thinking maybe you could label what parts of the city are so people know where they live. I don't know where I live on this map. If you just even put like "North Side", "South Side" people would be able to figure it out. That was just an idea.

Don Lee 15:29

How about Aquacity?

Melissa Porter 15:37

I think he was engaged. I'd say a four just because I was kind of like "we have to do this" and get it done. But it was very time consuming cutting out all the little pictures. I don't know how to say what to do about that. But so I cut them all out and he set it up. We didn't get time to do the coloring or the gluing it on but that would be like taking a few days if you were just working on it at your leisure. That that could be like a fun activity you could just be probably spend an hour just doing that.

Don Lee 16:23

Overall, do you think Donovan had a pleasurable experience with the booklet? Did he have fun?

Melissa Porter 16:30

Yeah. Yeah. Awesome.

Don Lee 16:37

Let's see. So our next question is more on the content and the learning experience of the book. So what kind of conversations did you and your child have while working on the booklet?

Melissa Porter 16:56

Well, I had to explain to him what the size of the water bottle is and ask him to imagine how much water was coming out. So we discussed the size of the water bottle, and then I was kind of like "really? Are you sure you think it's that much" because I thought his guesses were way off when they weren't really even that far off. But I was just thinking that it was gonna be much higher number.

What else did we talk about? Oh, like how we had to actually talk a lot about how many times we've went to the bathroom. We were multiplying everything by three because there's three of us. We thought about how many times we flush the toilet, showers, teeth brushing... We had to decide whether we had a new or old toilet. So, I know a lot of our stuff is ENERGY STAR told them about that.

Don Lee 18:21

So our overarching goal was to educate our users about water quality and water use. And our target audience is children. But we were originally thinking five to 10 years old, but after speaking with you, maybe we should bump it up a bit. Do you think Donovan learned about water quality and water use from this book?

Melissa Porter 18:55

For sure. It made him think because he really does waste a lot of water. Like he likes to take a bath, fill up the whole bathtub, and then just like drain it and be done. I feel like that's really a lot of water. And I tell him that all the time and showed him through the water bottles, but I don't know that it's going to change his view yet. I mean, he's just about to be seven years old but it was definitely a good start to put introduction.

Maybe for an older kid, he would be thinking "Oh, I can actually do things that we already know". We don't leave the water running when we brush our teeth and I was like, "oh, some people leave the water running for the whole time they're brushing their teeth". That was good to say you know to show the difference between when you leave it running the whole time.

Don Lee 21:04

Something that interested me was that Donovan scored only one point on Aqua city. Do you think there was any reason why he didn't put more green infrastructures?

Melissa Porter 21:20

Yeah, I think he had never seen them before. I showed him what each thing was but, when he was building the city, he really just used the stuff that looks familiar. I think he mainly just used the buildings and he used a couple flower gardens, which were zero. I don't think he even realized there was a difference between flower garden and rain garden. I didn't know until I was doing the scoresheet. So, I don't know how to make them think more about using those [green infrastructures]. Probably with the older kids, they would use them. I even explained each one and where to put a green roof and permeable street paving but he didn't remember to use them and I didn't like pressure him because I didn't know if you wanted like realistic results from a kid. So yeah, mainly he just set it up like houses and swimming pool... he knew cars were bad so he didn't put any car. Yeah, I think probably just just he wasn't wasn't sure about what they were.

Don Lee 22:37

Yeah, one question I had was whether Pittsburgh elementary schools teach about environmental issues like water quality.

Melissa Porter 23:01

He's in first grade and they don't really seem to talk about that stuff. They don't really have much science. So yeah it would be nice to teach so much it's mainly just focus...

Don Lee 23:23

So I guess Donovan's prior knowledge about water quality would be close to zero then.

Melissa Porter 23:29

Oh yeah for him for sure. We do a lot of that here. We don't drink out of the plastic water bottles, we fill our own water bottles every day, and our fridge has a filter. So I explained that's why we don't use all these plastic ones because I showed him the pictures and said these all end up in the dock or the ocean and everything. So he understands why we use the reusable water bottles. But that's about as much as far as he knows right now, but we're, you know, we're pretty environmentally conscious. We have a electric car and everything and so he'll definitely get the information.

Don Lee 24:20

All right, yeah. Just to sum it up, so it took Donovan about an hour to complete the booklet.

Melissa Porter 24:37

I mean he could spend more time. If we didn't have to get it done over the weekend, he probably could have done maybe an activity a day for like a whole week. Yeah, that's probably what a person would do with it. I was kind of just saying, "Okay, let's, since I wanted to have something to be able to tell you guys"...

Selena Zhen 25:03

I have one question that just came up. So this is for the Carnegie Museum of Natural History. Do you guys go there often? Or how many times has he been there?

Melissa Porter 25:12

He's probably been there five times.

Selena Zhen 25:15

Okay. If you had seen this as like a handout or something that the museum was handing out, or mailing out, would you be interested in this sort of activity?

Melissa Porter 25:24

Oh, yeah. Yeah. We weren't sure. Were you calling it h2-ome or-

Selena Zhen 25:31

It's kind of like a play on.

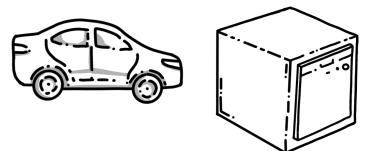
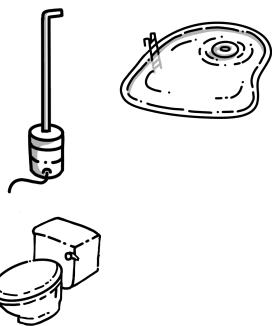
#### **SUMMARY (Likert scale)**

- BOTTLING YOUR WATER: 5
- FIND THE WATER: 5
- WATER BEYOND SIGHT: N/A (1)
- FLUSH IT: 5
- AQUACITY: 4

## **Appendix B - Presentation and Findings Slides (April 31, 2020)**

See next page!

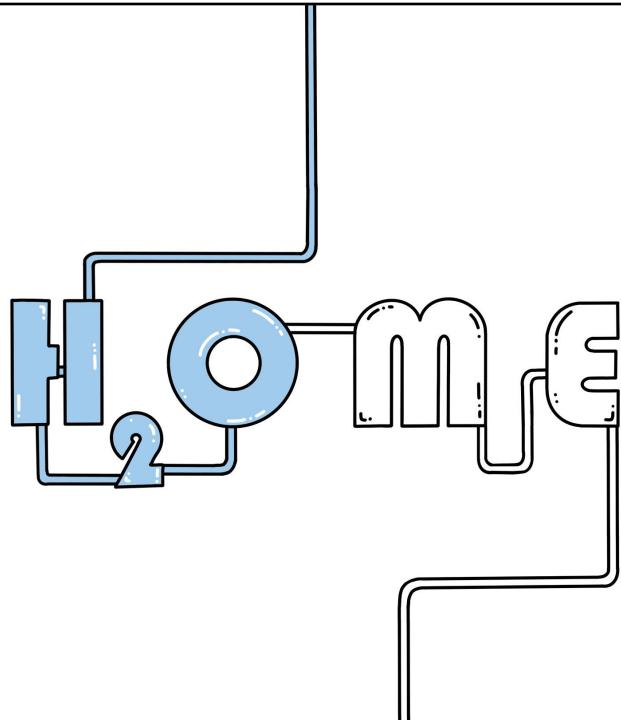
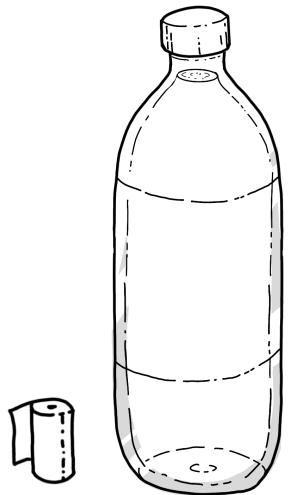
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# WATER

Learning in Museums, Spring 2020

Daniel Noh, Don Lee, Selena Zhen

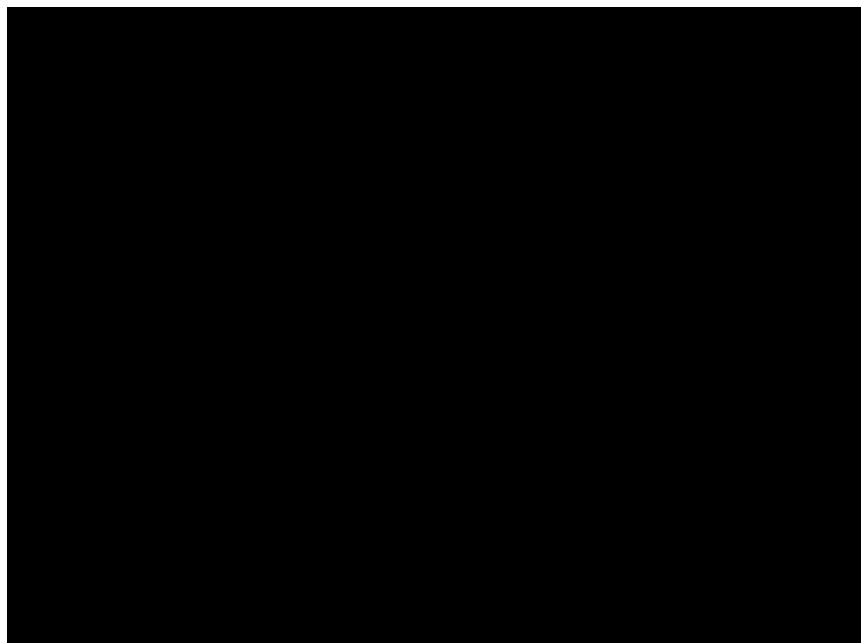


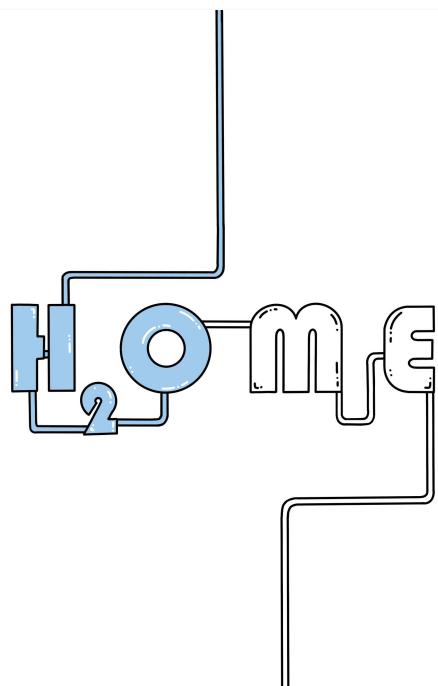
## **Project Introduction**

For our Learning in Museums project, we have created an activity booklet called H<sub>2</sub>OME, which is designed and written about the topic of Water.

Our hope is that the booklet provides a learning opportunity for museum visitors and their friends/family about the region's water story, as well as their own personal home water story.

The booklet is designed for children in grades 3-5, but we highly encourage parents to participate in the activities as well.





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**H<sub>2</sub>OME**  
2020

Created for Carnegie Museum of Natural History

**Designed and Written by:**  
Daniel Noh  
Don Lee  
Selena Zhen

**Learning In Museums, Spring 2020**  
Carnegie Mellon University



## INTRODUCTION

Hello!

Welcome to H<sub>2</sub>OME! This activity booklet was designed and created for the Carnegie Museum of Natural History with love and respect to an extremely relevant and regional topic of the Anthropocene - our local water system. Our hope is to help every Pittsburgher learn more about their home and regional water story. How much water do you use on a daily basis? Where does the water come from? Do you know where your wastewater goes? And what ways can YOU help improve and maintain our current water resources?

H<sub>2</sub>OME includes a variety of activities that provide many individual and collaborative learning opportunities to you, your friends, and your family. We hope you have fun coloring, working, and building cities to learn more about your water story!

Thank you to Marti Louw and the staff at the Carnegie Museum of Natural History for their help and contributions to the research that created H<sub>2</sub>OME!

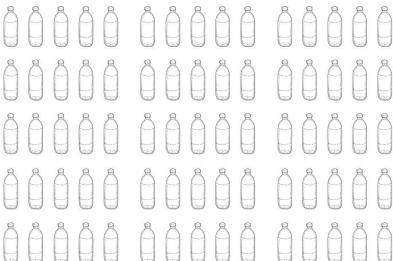
Enjoy!

Daniel, Don & Selena  
*Designers and Writers*

# BOTTLING YOUR WATER

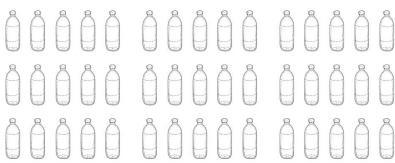
In this section, learn about water usage at home, in the form of bottles of water! First, try to answer these 3 questions before moving on to the next page! Mark off or color in the number of water bottles as your answer.

1. How much water do you think is used during a **5 minute shower**?

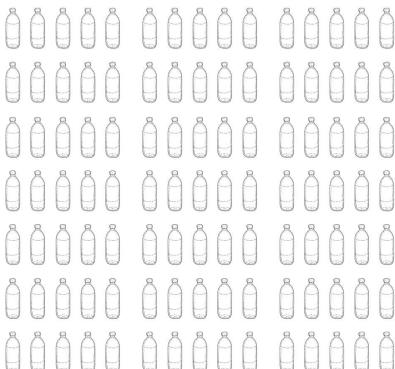


A typical bottle of water  
is 500 mL or 16.9 oz!

2. How much water do you think **one toilet flush** will use?



3. How much water do you think **one dishwasher load** will use?



## COMPARE & CONTRAST

Check out the diagrams to see how much water you might use on average for each water-related activity around your home.

### 1 Bottle of Water

Plastic bottles of water can take about three times as much water to produce than they can actually hold!  
about 3 water bottles (or 0.79 gallons)



### One Toilet Flush

Older Toilet (pre-1992)  
about 27 water bottles (or 3.5 gallons)



High Efficiency Toilet  
about 10 water bottles (or 1.3 gallons)



### Brushing your Teeth

If the faucet was on for 30 seconds  
about 4 water bottles (or half a gallon)



If the faucet was on for 2 full minutes  
about 15 water bottles (or 2 gallons)



### One Dishwasher Load

Older Model Dishwasher  
about 99 water bottles (or 13 gallons)



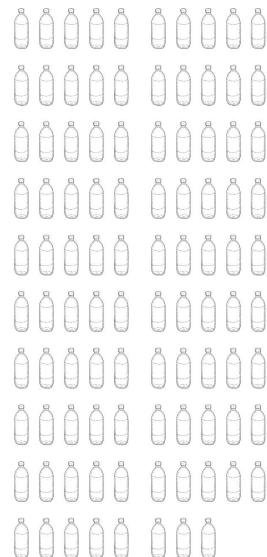
ENERGY STAR® Dishwasher  
about 42 water bottles (or 5.5 gallons)



### Taking a Shower

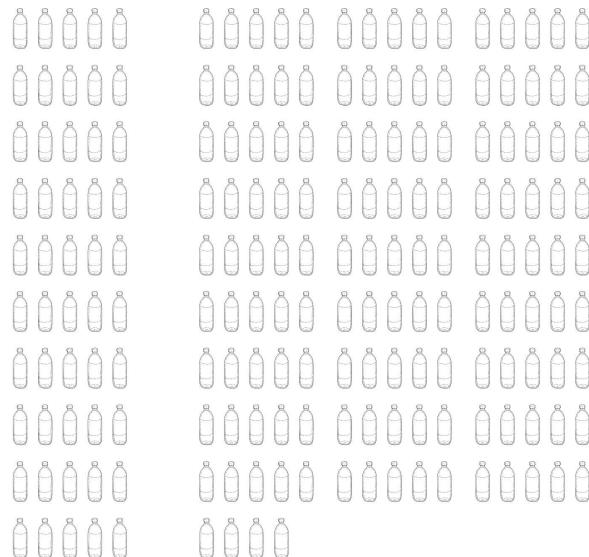
5 minute shower

about 98 water bottles (or 12.5 gallons)



10 minute shower

about 196 water bottles (or 25 gallons)



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## WHAT ABOUT YOU?

Work with your family and friends to keep track of how much water everyone has used in the bathroom. For each calculation on the next page, fill in the blue boxes using the conversions in the Bathroom Water Cheat Sheet.

### BATHROOM WATER USE CHEAT SHEET

#### Toilet Flush

1 flush (pre 1992 toilet) -----> 27 water bottles per flush

1 flush (with a newer or High Efficiency Toilet) -----> 10 water bottles per flush



#### Taking a Shower

1 minute in the shower -----> 19 water bottles per minute of showering

#### Brushing your Teeth

Brushed with the faucet on for 30 seconds -----> 4 water bottles per brushing

Brushed with the faucet on for 2 minutes -----> 15 water bottles per brushing

Check out these resources to learn more about home water usage and your water footprint.

[home-water-works.org](http://home-water-works.org)

[watercalculator.org](http://watercalculator.org)

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#### Toilet

How many times was the toilet flushed today?

$$\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \boxed{\phantom{000}} \end{array}$$

total flushes  
water bottles per flush  
total water bottles

#### Taking a Shower

How much total time (minutes) did your household spend in the shower?

$$\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \boxed{\phantom{000}} \end{array}$$

total minutes  
water bottles per minute of showering  
total water bottles

#### Brushing Teeth

How many times did your household brush teeth with the faucet on for 30 seconds?

$$\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \boxed{\phantom{000}} \end{array}$$

total brushing  
water bottles per brushing  
total water bottles

How many times did your household brush teeth with the faucet on for 2 minutes?

$$\begin{array}{r} \boxed{\phantom{00}} \\ \times \quad \boxed{\phantom{00}} \\ \hline \boxed{\phantom{000}} \end{array}$$

total brushing  
water bottles per brushing  
total water bottles

Add up the total number of water bottles! How much water did your household use in the bathroom today?

$$\boxed{\phantom{000}}$$

total water bottles

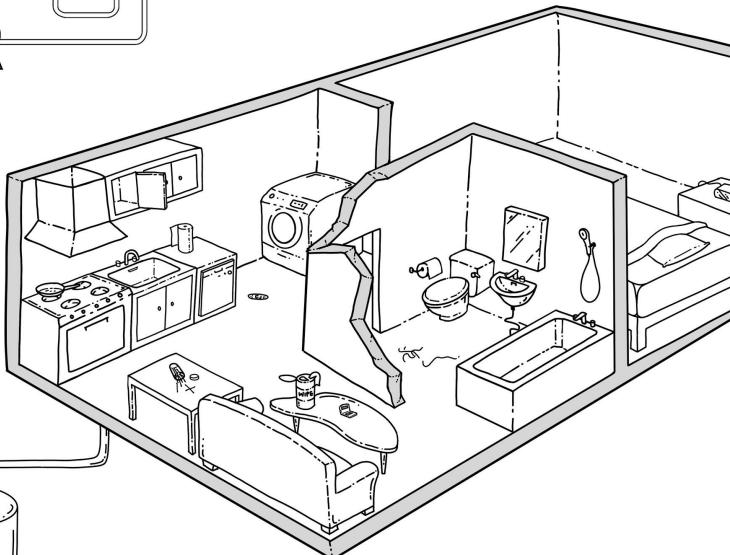
8

# FIND THE WATER

There are a lot of places where water is used in the typical home. Can you find all eight appliances that use water in this drawing? Color them in!

There are many domestic pollutants that shouldn't go into our wastewater, yet often do. These commonly enter the wastewater system via toilets and sinks, and can cause blockages or damage to your home's plumbing system as well as the local water resources in Pittsburgh. Try to remember to dispose of these properly next time! Can you find all seven common pollutants? Color them in!

Need a hint on what to look for? Turn the page and check out the list of water appliances and water pollutants on page 11.



## WASTEWATER POLLUTANTS



**paper towels**

Paper towels do not have the same characteristics as toilet paper and do not disintegrate easily down the sewer line.



**wipes**

Wipes are not decomposable like toilet paper, and can lead to blockages in the sewage system.



**cotton swabs**

Cotton Swabs don't break down quickly, and can block drains.



**hair**

Hair can form giant balls which create massive blockages and trap unwanted odors in your plumbing.



**cooking grease**

When fat cools off, it becomes hard as a rock, blocking the system.



**gum**

Gum can act like glue, and gets stuck in the pipes, causing blockages.



**bandages**

Bandages are primarily made from non-biodegradable plastic, and won't break down in water.

## TRY IT OUT AT HOME!

Take pictures of the appliances that use water in your home. Note them or draw them here. How many do you have? Do you know what they all do? What do you use the most?

## WATER APPLIANCES



**showerhead**



**dishwasher**



**kitchen sink**



**washing machine**



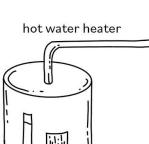
**bathtub**



**bathroom sink**



**toilet**



**hot water heater**

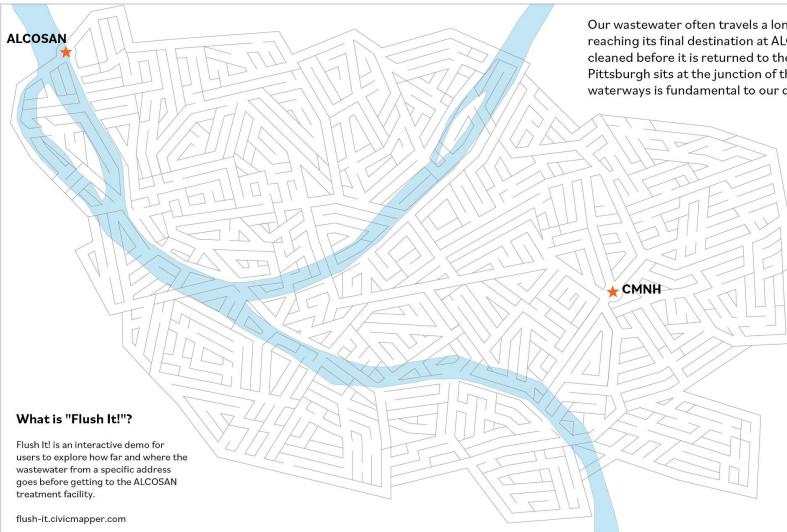
Now that you know about some common pollutants that go into our wastewater systems, try to collect all of the pollutants you can find in your home! What do they look like? Why do you think they are bad for our water system? Talk with your family or friends to see how you can treat your wastewater better in the future.

Share pictures of your own water sources and water pollutants on social media with the hashtag #H2OME.CMNH

# FLUSH IT!

## CMNH EDITION

Find your way through the maze to see the geographical path that wastewater travels, from the Carnegie Museum of Natural History (CMNH) to ALCOSAN.



### What is "Flush It!"?

Flush It! is an interactive demo for users to explore how far and where the wastewater from a specific address goes before getting to the ALCOSAN treatment facility.

[flush-it.civicmapper.com](http://flush-it.civicmapper.com)

Our wastewater often travels a long and complicated path before reaching its final destination at ALCOSAN, where it is treated and cleaned before it is returned to the region's waterways. Because Pittsburgh sits at the junction of three rivers, protecting our waterways is fundamental to our daily lives.

### Did you know?

Wastewater from the CMNH travels 67,817.73 feet (**12.80 miles**) through the sewer network before reaching the ALCOSAN treatment facility.

It takes anywhere between **9 hours - 19 hours** to reach the treatment plant.

### CMNH's flush passes through pipes in these communities:

Marshall-Shadeland  
South Side Flats  
Hazelwood  
Central Business District  
Chateau  
South Oakland  
Central Oakland  
North Oakland  
Squirrel Hill South  
Greenfield

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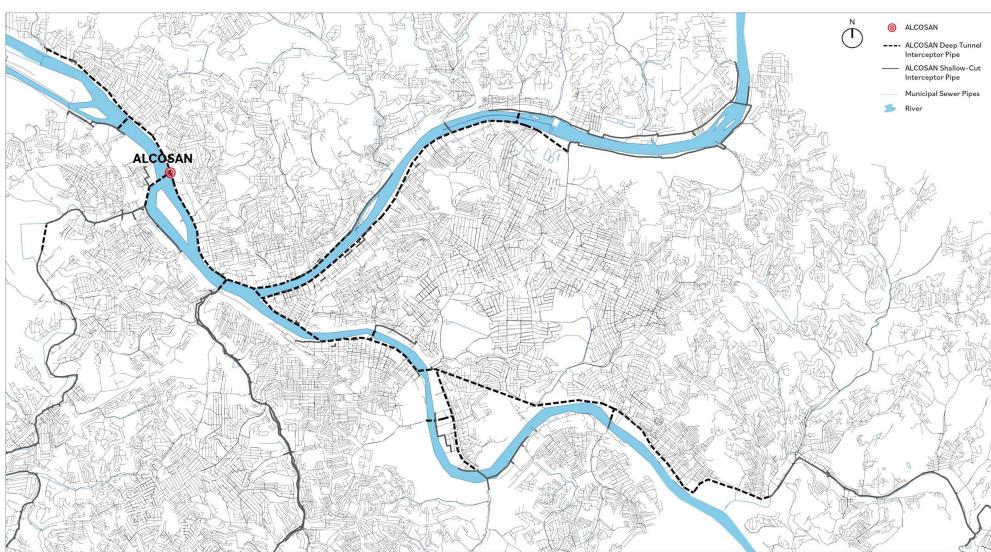
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## TRY IT YOURSELF!

This map shows the sewer infrastructure network in the ALCOSAN service area. With your family or friends, use the Flush It! online tool to see the path of your wastewater; from your home, to ALCOSAN. Use a coloring utensil to trace the path here!

[flush-it.civicmapper.com](http://flush-it.civicmapper.com)



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# WATER BEYOND SIGHT

## ACROSS - Green Infrastructure

- This green infrastructure collects rainwater from the roof of homes and captures it for later use.
- A \_\_\_\_\_ pavement is one that catches and filters rain and water from runoff.
- This green infrastructure covers the top of a building with vegetation to primarily absorb rainwater.
- This green infrastructure features an area, usually placed near homes, with vegetation that collects and soaks water into the ground.
- This green infrastructure strategy incorporates vegetation and other stormwater management elements in places where cars run or pedestrians walk. They are designed to capture rainwater at its source, and often involve bioswales, rain gardens, and permeable pavement.
- This green infrastructure is a shallow, open channel that reduces water runoff by infiltration.

## DOWN - Pittsburgh Water Infrastructure

- The name of the sewage treatment plant that filters the wastewater from your bathtub, toilet, and sinks.
- The name of the river that runs from Pittsburgh to New York and flows alongside Pittsburgh's sports stadiums like Heinz Field and PNC Park.
- The name of the river that usually is a shade of brown and provides hydroelectric power to cities along its banks.
- The \_\_\_\_\_ Park Reservoirs supply 20 million gallons of water per day and remains the only open-air reservoir in the city.
- The name of the river that is formed by the convergence of two rivers in Pittsburgh but has been ranked one of the most polluted rivers in the United States.
- Initials of the service that handles Pittsburgh's water treatment and sewer systems.

There are many hidden systems within our water resources, from underwater water and sewer lines, to infrastructure designed to manage our stormwater. Water serves as an integral part of our everyday lives, and it is critical that we learn about our local water story. Use the words below to complete the crossword puzzle.

PWSA

RAIN GARDEN

MONONGAHELA

HIGHLAND

ALCOSAN

GREEN ROOF

PERMEABLE

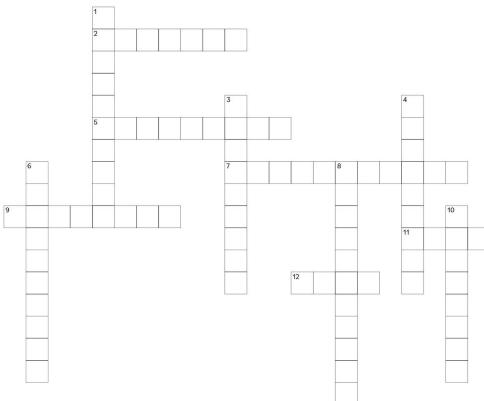
BIOSWALE

OHIO

ALLEGHENY

RAIN BARREL

GREEN STREET



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## LEARN MORE ABOUT PITTSBURGH'S WATER STORY

ALCOSAN provides wastewater treatment services 24 hours a day, seven days a week.

[alcasan.org](http://alcasan.org)

3 Rivers Wet Weather (3RWW) is a nonprofit environmental organization created to address the Pittsburgh's wet weather overflow problem.

[3riverswetweather.org](http://3riverswetweather.org)

Pittsburgh Water and Sewer Authority (PWSA) is responsible for water treatment and delivery systems in the city of Pittsburgh.

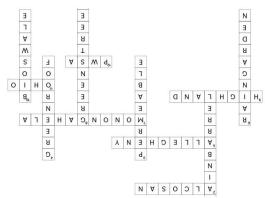
[pgt2o.com](http://pgt2o.com)

Pittsburgh Collaboratory is a platform where community and science meet to improve and sustain regional water resources, incorporate science into decision making, respond to community needs, and cultivate future water leaders.

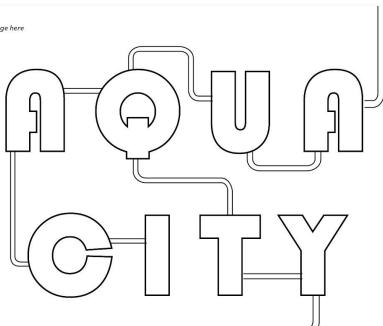
[water.pitt.edu](http://water.pitt.edu)

## KEEP YOUR EYES OPEN!

Pittsburgh is full of water infrastructure! All you need to do is look; next time you take a walk or go on a drive somewhere, keep your eyes open and look for things like green infrastructure elements or hints of water/sewer lines.



Cut out page here



You've been voted as the mayor of Aqua City! Your first task is to help design and develop two empty blocks in the city center. As the new mayor, part of your duty should be to improve the way water is handled in the city. Try to be more water-conscious and water-sustainable, and use this activity to learn about the cause and effect of home and city infrastructure.

Feel free to color and decorate the Aqua City components as you see fit!

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## INSTRUCTIONS

*Cut out page here*

1. Cut out pages 20-27.
2. Decorate and cut out the individual infrastructure components that will be used to customize the new blocks. Additionally, decorate and cut out the individual building components where people will live and roam in your city.
3. On the map (pages 29 and 30), arrange the buildings and infrastructure components on the two empty blocks of the map. Pick and choose the elements that you'd like to include as new mayor. Don't forget that Aqua City should be water sustainable, so try to choose infrastructure components that will make your city beautiful as well as aqua-friendly. Check out the Aqua City Index to see what each infrastructure component can do for your city.
4. Finally, check how environmentally friendly your city's water-planning is by calculating your points using the Score Sheet. A higher score means your city is more water-conscious and water-sustainable!
5. Show us how you did by taking a picture of your city and sharing it on social media with #H2OME.CMNH

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## AQUA CITY INDEX

Included in your Aqua City Kit:



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## SCORE SHEET

*Cut out page here*

Use the Score Sheet to calculate the score of your city. How did you do? What are ways you can improve your score? Feel free to rebuild your city, then recalculate your score. A higher score means your city is more water-conscious and water-sustainable!

Component	Points	Your Quantity	Points Subtotal
Bioswale	2	X	
Permeable Street Pavement	2	X	
Rain Garden	1	X	
Green Roof	1	X	
Rain Barrel	1	X	
Flower Garden	0	X	
Bench	0	X	
Car	-1	X	
Fish Pond	-1	X	
Lawn Sprinkler	-1	X	
Pool	-1	X	
Fountain	-2	X	

**TOTAL SCORE**

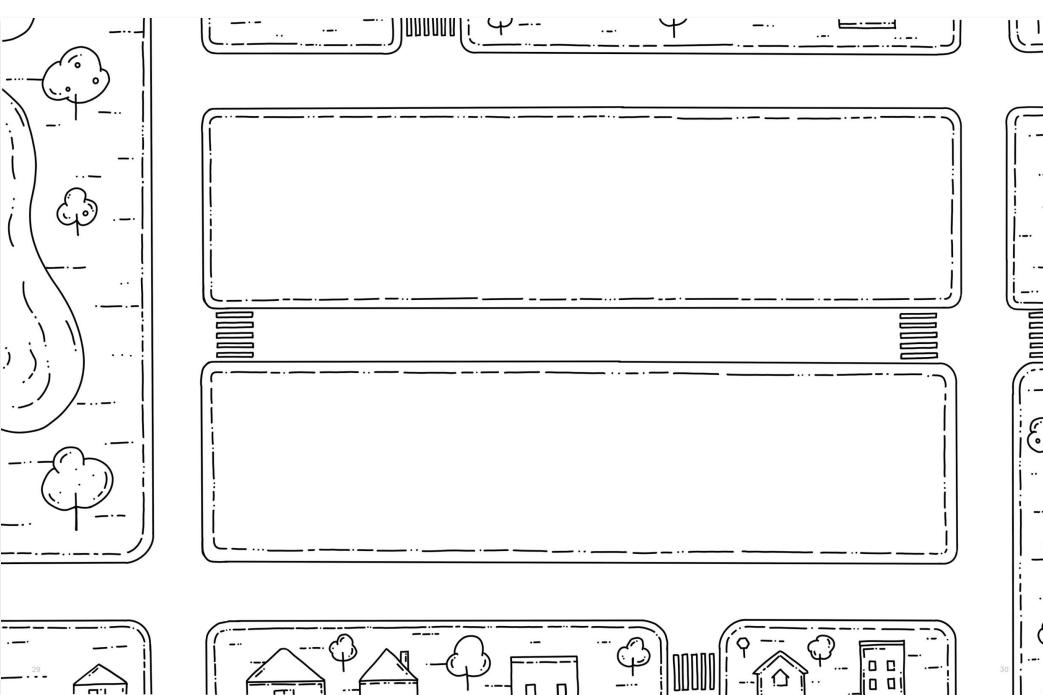
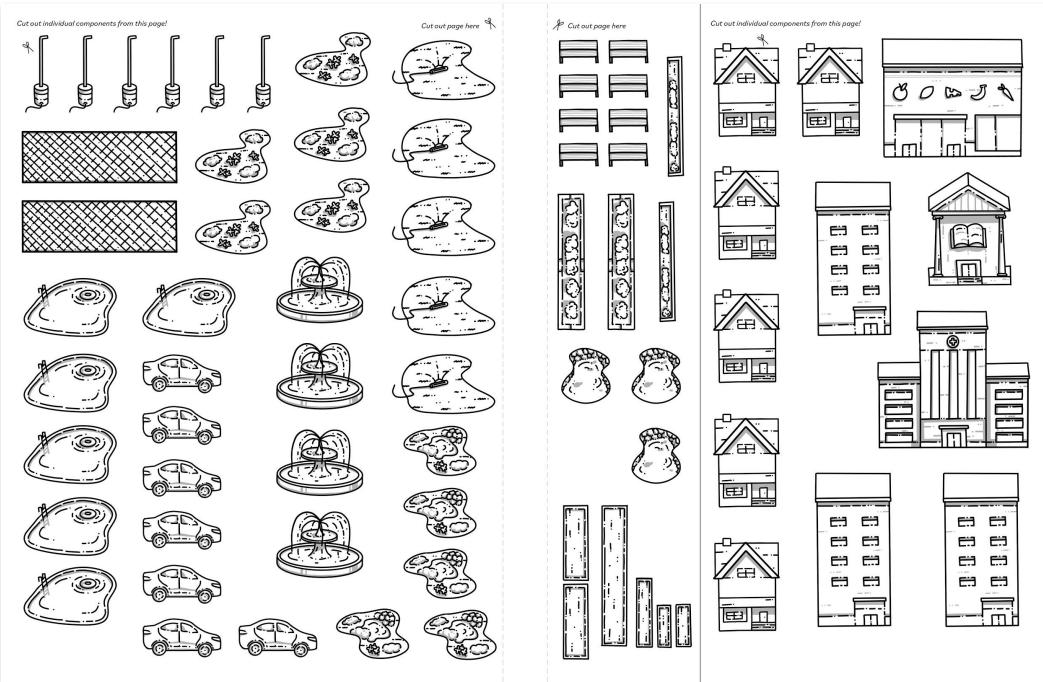
*Cut out page here*

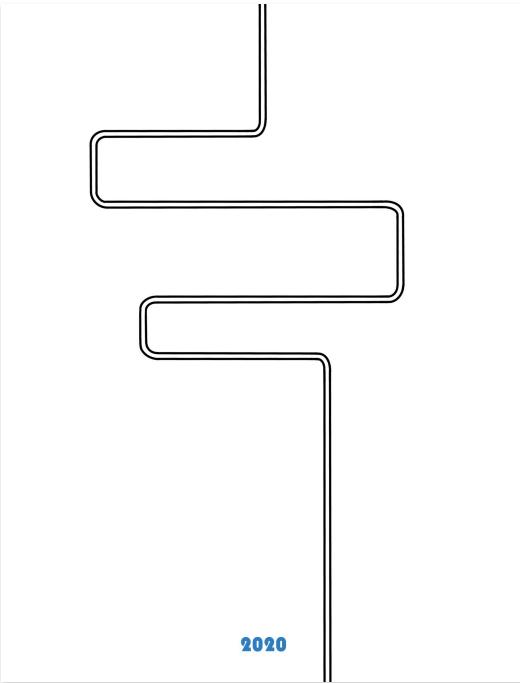
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## Prototyping Case Study

Case Study Subject: **7 y/o son with mother**

- + From outskirts of Pittsburgh (Dormont)
- + Elementary school doesn't really teach/focus on environmental issues
- + Both mother and son have been to CMNH (the son has been around 5 times)
- + The family does not use plastic bottles, and the mother has prior understanding of the importance of environmental awareness (water filter, turn off sink when brushing teeth, etc)

## Prototyping Session

Procedure: The family was given a physical copy of the booklet, and were suggested to complete as much of the booklet as they could together. After a couple of days, we called back via Zoom to receive feedback, starting from general questions to more specific questions.

The interview was divided into three broad categories:

**Usability**

**Engagement**

**Learning/Content**

and opened up to further comments at the end.

## Usability

The booklet took the family **an hour** to do the whole thing, excluding the crossword puzzle.

It was, however, rushed due to the mother's desire to do as much before the Zoom interview and we were told that the booklet had enough content to spend a couple of minutes everyday for at least a week and spread it out.

The child focused more on the visuals, while the mother focused on explaining the activities to the child.

There were small issues, such as the cutout part taking too long/too much effort to cut out, but generally all of the activities were clear, especially the wording and directions.

## Engagement

Used Likert scale (1 - least engaged, 5 - very engaged)

### Bottling Your Water



5

### Find the Water



5

### Water Beyond Sight



1

### Flush It!



5

### Aqua City



4

## Expert Blind Spot

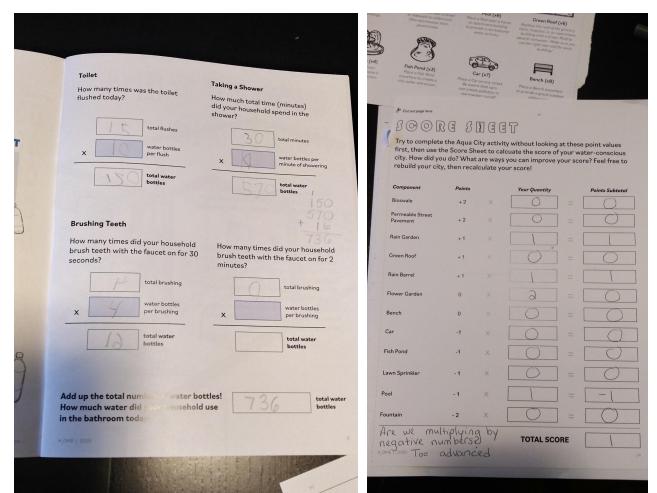
Our original target range was **5 to 10 years old**.

Children usually learn multiplication starting grade 3.

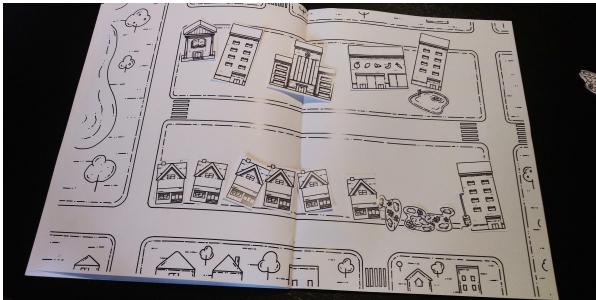
(<https://www.verywellfamily.com/what-your-child-will-learn-grade-guide-620869>)

Grade 3 students are on average **9 years old**.

Solution: bump up the target audience range; consult learning design experts; require parent-child cooperation



## Familiarity Principle



Score Sheet			
Try to complete the Aqua City activity without looking at these point values first, then use the Score Sheet to calculate the score of your water-conscious city. How did you do? What are ways you can improve your score? Feel free to reheat your city, then recalculate your score!			
Component	Points	Year Quantity	Points Subtotal
Bioswale	+2	<input type="radio"/>	=
Permeable Street Pavers	+2	<input type="radio"/>	=
Rain Garden	+1	<input type="radio"/>	=
Green Roof	+1	<input type="radio"/>	=
Rain Barrel	+1	<input type="radio"/>	=
Flower Garden	0	<input type="radio"/>	=
Bench	0	<input type="radio"/>	=
Car	-1	<input type="radio"/>	=
Fish Pond	-1	<input type="radio"/>	=
Lawn Sprinkler	-1	<input type="radio"/>	=
Pool	-1	<input type="radio"/>	= -1
Fountain	-2	<input type="radio"/>	=
Are we multiplying by negative numbers? Too advanced			TOTAL SCORE
			1

Why only a score of one?

Did not do Activity 3, so did not have prior knowledge

Only chose familiar objects

"He really just used the stuff that looked familiar."

## Content Difficulty

BIOSWALE      PERMEABLE STREET      RAIN BARREL  
GREEN ROOF      RAIN GARDEN

"What is that?"

### ACROSS - Green Infrastructure

1. This green infrastructure collects rainwater from the roof of homes and captures it for later use.
3. A \_\_\_\_\_ pavement is one that catches and filters rain and water from runoff.
4. This green infrastructure covers the top of a building with vegetation to primarily absorb rainwater.
6. This green infrastructure features an area, usually placed near homes, with vegetation that collects and directs runoff into the ground.
8. This green infrastructure strategy incorporates vegetation and other stormwater management elements in places where cars or pedestrians walk. They are designed to capture rainwater at its source, and often involve bioswales, rain gardens, and permeable pavement.
10. This green infrastructure is a shallow, open channel that reduces water runoff by infiltration.

### DOWN - Pittsburgh Water Infrastructure

2. The name of the sewage treatment plant that filters the wastewater from your bathtub, toilet, and sinks.
5. The name of the river that runs from Pittsburgh to New York and flows alongside Pittsburgh's sports stadiums like Heinz Field and PNC Park.
7. The name of the river that usually is a shade of brown and provides hydroelectric power to cities along its banks.
9. The \_\_\_\_\_ Park Reservoirs supply 20 million gallons of water per day and remains the only open reservoir in the city.
11. The name of the river that is formed by the convergence of two rivers in Pittsburgh but has been ranked one of the most polluted rivers in the United States.
12. Initials of the service that handles Pittsburgh's water treatment and sewer systems.

High level of difficulty deterred participant from trying out the crossword puzzle right away

## Post Questions

Are users more conscious of their water use after using H2OME?

Have users changed their behaviors and habits to be more water friendly?

Do users have intent to place green infrastructures around their homes?

What differences in learning outcomes can we expect from participants living in different environmental contexts (ie. city vs. rural; house vs. apartments)?

What is the optimal age range for this booklet, in terms of difficulty, engagement, and potential impact?

Which place does this booklet serve in the museum? Where is it located? Or should it be simply something that is mailed or downloaded at home?

Thank you!



## Appendix C - Reviewer Comments (from Presentation on April 31, 2020)

Or go back to the [Table of Contents](#).

Presentation Reviewers:

	Karen Lightman, Jo Tauber, Jonaya Kemper
<b>10:40 - 10:55</b>	
<b>10:55 - 11:10</b>	Mandi Lyon, Nina Barbuto
<b>11:10 - 11:25</b>	Ciara Cryst, Anne Fullenkamp
<b>11:25 - 11:40</b>	Asia Ward, Robert Zacharias
<b>11:40 - 11:55</b>	Camellia Sanford

Chat from Zoom (from Final Presentation):

10:47:37        From Karen Lightman : I need a copy of this to share with my teenagers who take long showers!!

10:49:11        From Jonaya Kemper : I love the visuals. As a former teacher of young children, that water bottle usage is very easy to understand for younger ones and is a nice bond of interaction with an adult.

10:51:09        From Jonaya Kemper : That's super fun. It feels like an analogue Stardew Valley.

11:19:03        From Marti Louw : Please use chat for feedback as well

11:30:40        From Anastasia Ward : I think that you should credit the CMNH, but CMNH is the mentor, and your class and your school is the Logo

11:30:51        From Anastasia Ward : I like the visualization with the waterbottles

11:31:27        From Anastasia Ward : Like the math portion. Great way to apply visualization

11:31:46        From Anastasia Ward : Layout and graphics are great

11:33:19        From Anastasia Ward : Crossword yeah! Fun way to learn vocabulary

11:35:46        From Robert Zacharias : 5 minutes

11:37:07        From Anastasia Ward : I can see parts of this booklet published in a local newspaper or community magazine. That way you could spread the content over more communities

## **Comments from other Reviewers via Google survey:**

### **What aspects of this project did you find compelling?**

loved the visuals - especially the use of water bottles to communicate the impact/use of water

I like the relevance of the calculating families' water use activity.

I really like the find the water activity's "try it at home" section.

The cutout sheet city is a cool idea.

Bumping up the age range to make sure activities (math) were age appropriate. Cool that this came out in testing. Like the idea of having teachers and informal educators test this too for content and activity developmental appropriateness.

The workbook is very clean, well designed and can become a living document that kids can keep using as they get older and they advance in their knowledge and interest.

The layout and graphics were perfect. The content great and approachable

I really like the take-home nature of this project, especially for the world today. The graphics were great!

This is a timely idea for museum-from-home content that gives parents something constructive to do with their children. I also felt the design was clean and could be adapted to a variety of activities, say if a museum wanted to do a series of these for instance.

LOVE the workbook you came up with. Great illustrations, really cleverly-designed activities, and I love that it all ties together at the end with an open-ended creative activity where the student designs their own city. I really like the attention to detail in your graphic design choices and the friendly overall look you achieved. (And clearly the H<sub>2</sub>OME logo is super clever as well.)

LOVE the do-at-home booklet - this is one kind of resource teachers and parents are asking the museum for right now. Loved the idea of scaling up from my own home to the whole city.

### **What areas could use more consideration?**

the definitions of green infrastructure like Bioswale, perhaps by adding a glossary?

Time spent (1 hour) of use might be a long time. Thinking about repeat use and sequencing of booklet (if city cutout is culminating activity), encouraging participants to go through other activities before the end.

I would focus on streamlining the book to include only 3 of the activities and look at how the water bottle data sheets could provide more information, besides just the silhouettes of the bottles.

More user/reader tests to see what can make the visuals stronger. i.e. the water bottles being filled/or a line to where they would be filled. The one water bottle is three water bottles question we raised. What does that mean? Should you go into it?

It seems like right now, you have to complete the entire book before doing the Aqua City activity, which isn't always possible with kids. Kids tend to want to jump to whichever activity seems the most hands-on. So maybe having an option to make the city, work through the other activities, and then revisiting and changing the city with what you learned would be good.

I know testing was difficult, but I wanted to hear more about whether the users were achieving the learning outcomes that you desired. Was this a good conversation-starter, or did children kind of fill it out and then move on to something else?

As I mentioned in our comment time at the end of your presentation, I think that filling in the water bottles with light blue water on pages 1-6 would have made it clearer that then the following questions (on pages 7 and 8) want the reader to use their own crayon/pencil to fill in the bottles as best they can guess.

While water conservation is obviously a good goal to promote for kids, I wonder why we have to put things in terms of bottled water? It's tricky, of course, to come up with a reasonable metric that will be understandable and legible—but if we're talking about water as sourced from the municipal supply, then probably 500ml bottles aren't the best way to show it. I mean, I don't know what is, to be fair! Just a thought.

The green infrastructure activity needs more thought - what activity would allow participants to understand how the features work and why they'd want to eventually incorporate them into the Aqua City? How can it be a bridge between the at-home activities, the sewer system activities, and Aqua City?

#### What areas could use more consideration?

loved this one - great job!

Crossword puzzle and Alcosan tracing from your own home seem like they are for older kids vocab and complexitywise.

I wouldn't focus on this as a coloring book. This information is rich, so if coloring is a tool to help convey more information, make that another activity.

In the chat box. I loved this project. The Anthropocene Section is considering on providing internships for students who have had theirs canceled. Members of this group would be perfect candidates. Please talk to Marti about this.

Great start! I missed part of the beginning, so please disregard if it's repetitive, but are there related activities that get your audience moving or investigating the world around them a bit more? I'd love to hear about how the workbook could help families explore their physical space indoors and out.

As far as I can tell, Alcosan's business is only on the wastewater side of the process; they don't deliver any water to customers (I think in Pittsburgh that's handled by PWSA). I think that it might be important/useful to explain that tidbit, since it's kind of a funny thing. The PWSA only handles clean water, and Alcosan only handles it once it's gone into the drain. If you draw this distinction, maybe you could use that as part of your final project thing in the workbook—there could be some collaborative effort where one student is an Alcosan engineer and another is working for PWSA; the Alcosan student cares only about reducing pollutants and storm runoff and those sets of problems, whereas the PWSA

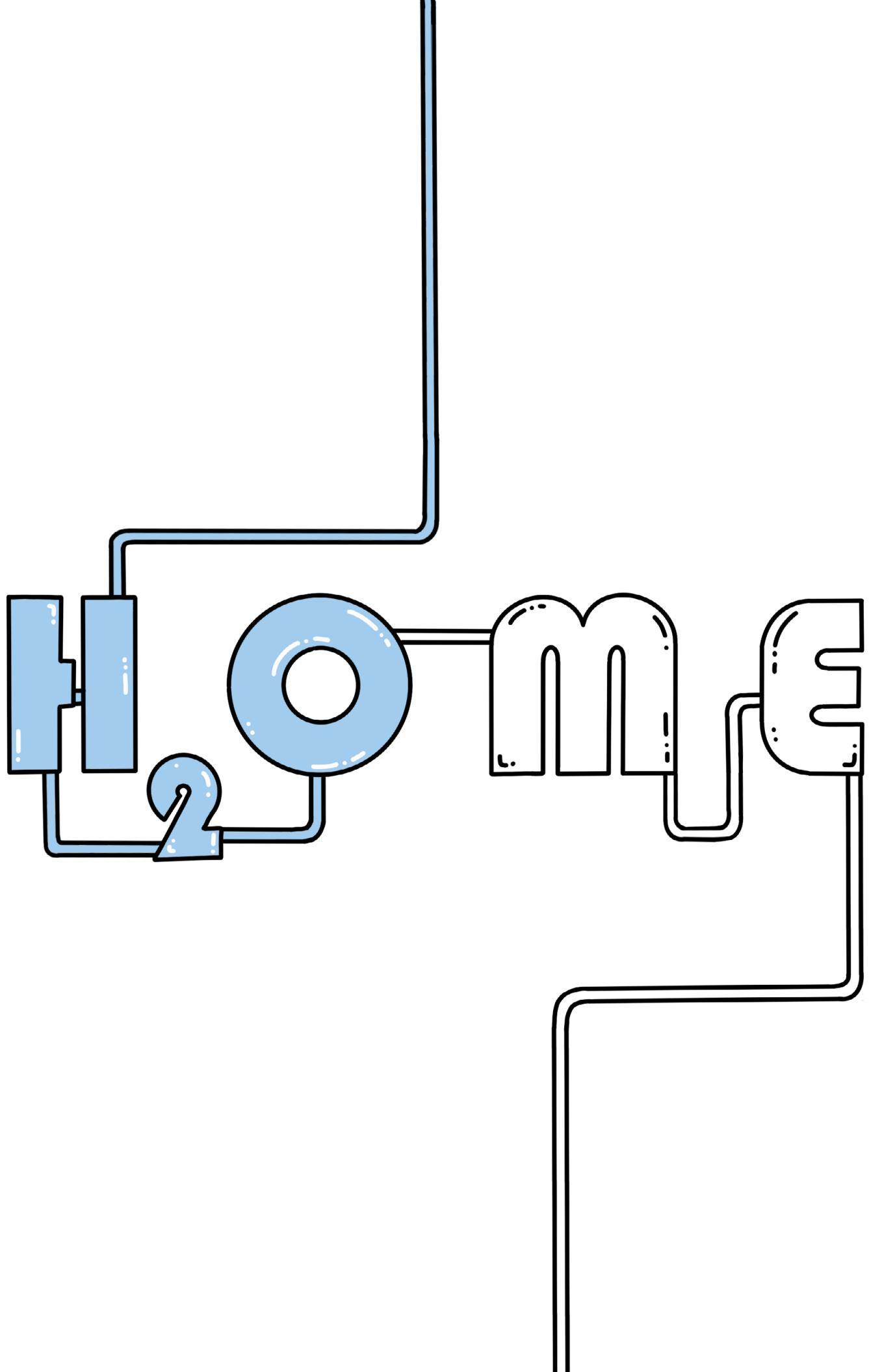
student cares about the volume of water used in showers and dishwashers, etc. Perhaps this is adding unnecessary complexity, but just a thought.

Overall—I'll reiterate that I think this was a very strong effort and I would love to see this workbook incorporated into a classroom or museum setting.

I appreciate how this group iterated on its design and made thoughtful changes based on feedback, and is still thinking of next iterations.

## **Appendix D - Full H<sub>2</sub>OME Booklet (Spreads)**

Or go back to the [Table of Contents](#).



# CONTENTS

1 Bottling Your Water

9 Find the Water

13 Flush It!

17 Water Beyond Sight

20 Aqua City

## INTRODUCTION

Hello!

Welcome to H<sub>2</sub>OME! This activity booklet was designed and created for the Carnegie Museum of Natural History with love and respect to an extremely relevant and regional topic of the Anthropocene - our local water system. Our hope is to help every Pittsburgher learn more about their home and regional water story. How much water do you use on a daily basis? Where does the water come from? Do you know where your wastewater goes? And what ways can YOU help improve and maintain our current water resources?

H<sub>2</sub>OME includes a variety of activities that provide many individual and collaborative learning opportunities to you, your friends, and your family. We hope you have fun coloring, working, and building cities to learn more about your water story!

Thank you to Marti Louw and the staff at the Carnegie Museum of Natural History for their help and contributions to the research that created H<sub>2</sub>OME!

Enjoy!

Daniel, Don & Selena  
*Designers and Writers*

**H<sub>2</sub>OME** 2020  
Created for Carneige Mellon University and  
Carnegie Museum of Natural History

**Designed and Written by:**

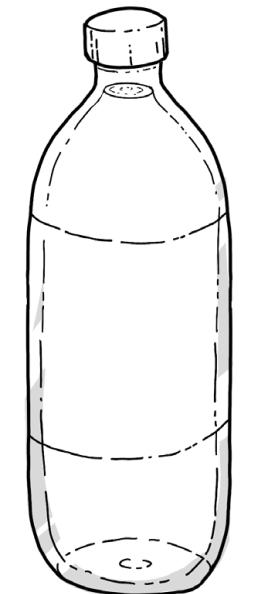
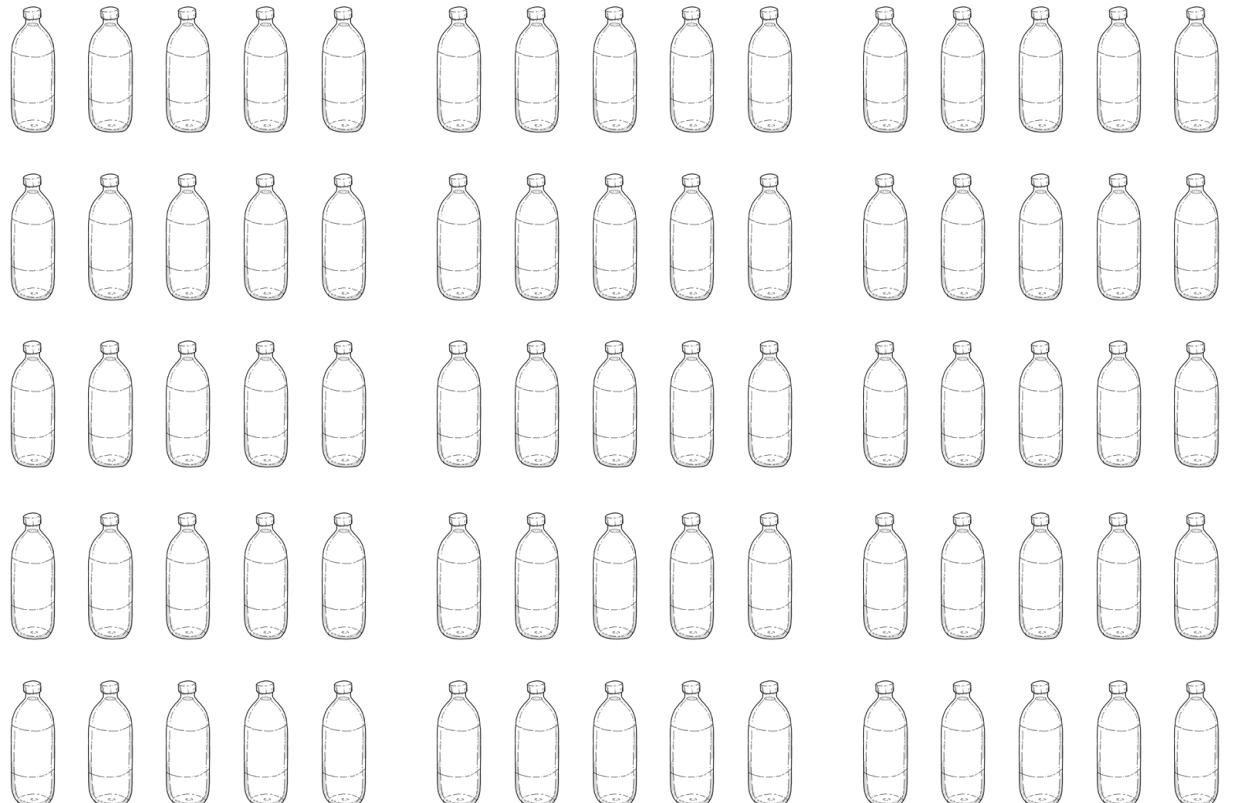
Daniel Noh  
Don Lee  
Selena Zhen

**Learning In Museums, Spring 2020**  
Carnegie Mellon University

# BOTTLED YOUR WATER

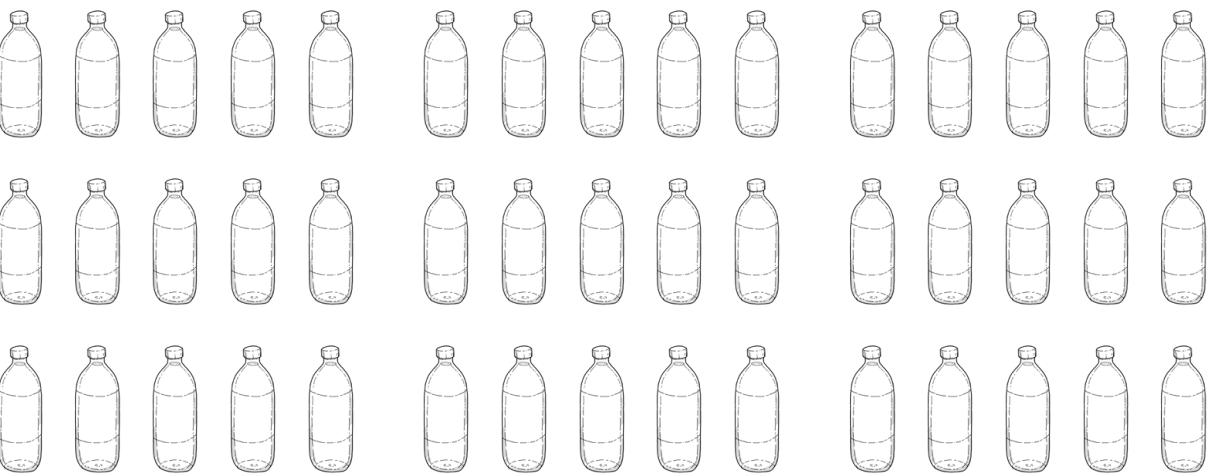
In this section, learn about water usage at home, in the form of bottles of water! First, try to answer these 3 questions before moving on to the next page! Mark off or color in the number of water bottles as your answer.

1. How much water do you think is used during a **5 minute shower?**

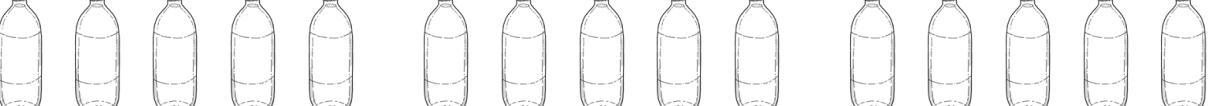
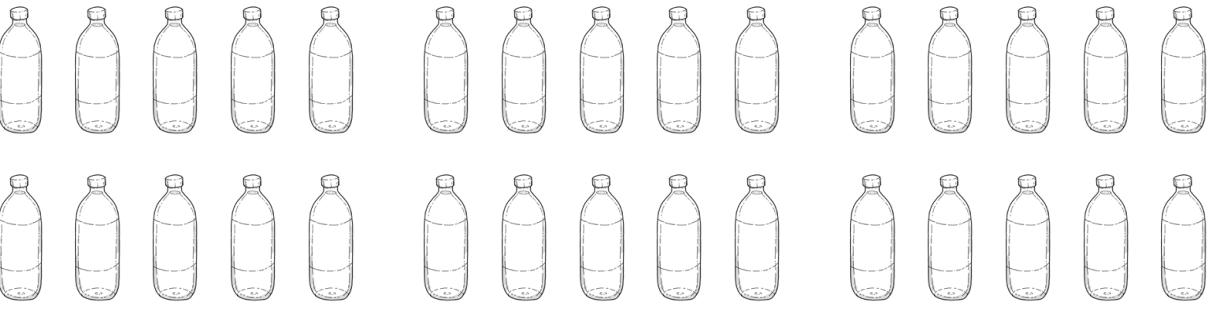
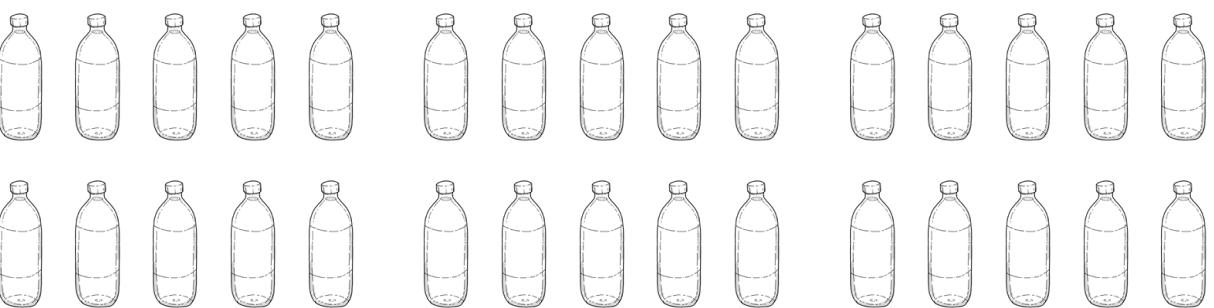


A typical bottle of water is 500 mL or 16.9 oz!

2. How much water do you think **one toilet flush** will use?



3. How much water do you think **one dishwasher load** will use?



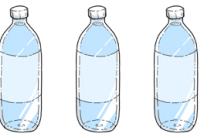
# COMPARE & CONTRAST

Check out the diagrams to see how much water you might use on average for each water-related activity around your home.

## 1 Bottle of Water

Plastic bottles of water can take about three times as much water to produce than they can actually hold!

about 3 water bottles (or 0.79 gallons)



## One Toilet Flush

Older Toilet (pre-1992)

about 27 water bottles (or 3.5 gallons)



High Efficiency Toilet

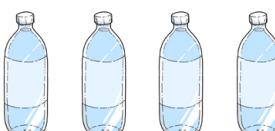
about 10 water bottles (or 1.3 gallons)



## Brushing your Teeth

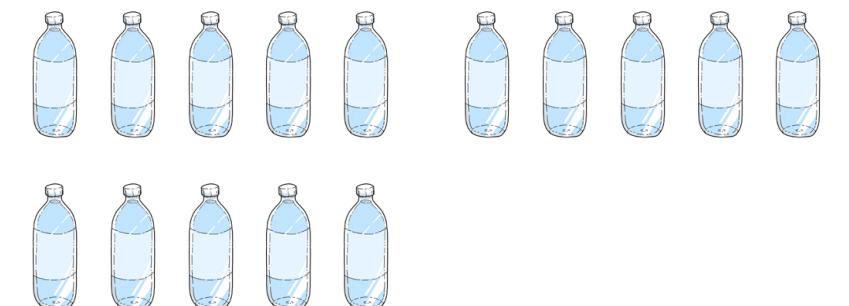
If the faucet was on for 30 seconds

about 4 water bottles (or half a gallon)



If the faucet was on for 2 full minutes

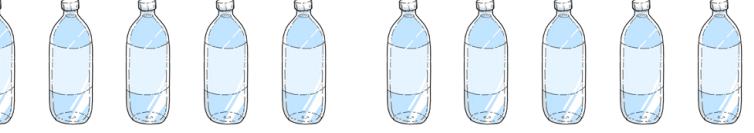
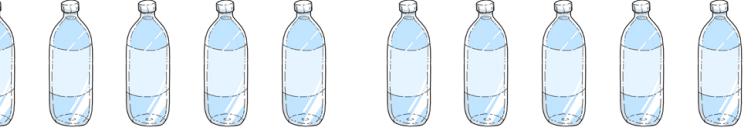
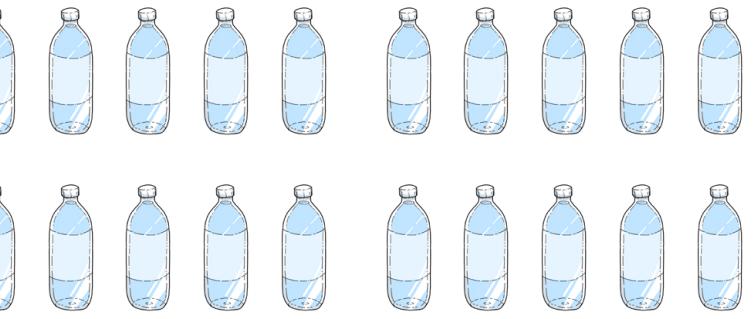
about 15 water bottles (or 2 gallons)



## One Dishwasher Load

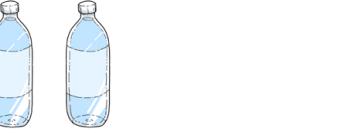
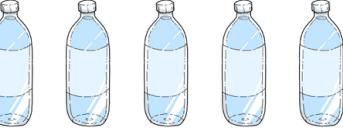
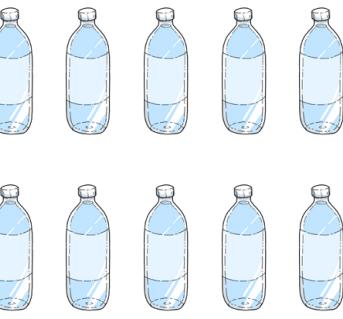
Older Model Dishwasher

about 99 water bottles (or 13 gallons)



ENERGY STAR® Dishwasher

about 42 water bottles (or 5.5 gallons)



## Taking a Shower

5 minute shower

about 98 water bottles (or 12.5 gallons)



10 minute shower

about 189 water bottles (or 25 gallons)



# WHAT ABOUT YOU?

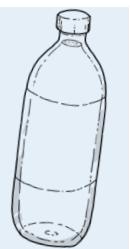
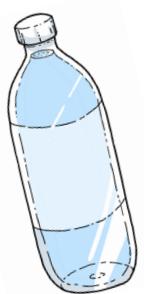
Work with your family and friends to keep track of how much water everyone has used in the bathroom. For each calculation on the next page, fill in the blue boxes using the conversions in the Bathroom Water Cheat Sheet.

## BATHROOM WATER USE CHEAT SHEET

### Toilet Flush

1 flush (pre 1992 toilet) -----> **27** water bottles per flush

1 flush (with a newer or High Efficiency Toilet) -----> **10** water bottles per flush



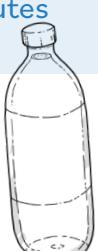
### Taking a Shower

1 minute in the shower -----> **19** water bottles per minute of showering

### Brushing your Teeth

Brushed with the faucet on for 30 seconds -----> **4** water bottles per brushing

Brushed with the faucet on for 2 minutes -----> **15** water bottles per brushing



**Check out these resources to learn more about home water usage and your water footprint.**

[home-water-works.org](http://home-water-works.org)

[watercalculator.org](http://watercalculator.org)

### Toilet

How many times was the toilet flushed today?

total flushes

X

water bottles per flush

**total water bottles**

### Taking a Shower

How much total time (minutes) did your household spend in the shower?

total minutes

X

water bottles per minute of showering

**total water bottles**

### Brushing Teeth

How many times did your household brush teeth with the faucet on for 30 seconds?

total brushing

X

water bottles per brushing

**total water bottles**

How many times did your household brush teeth with the faucet on for 2 minutes?

total brushing

X

water bottles per brushing

**total water bottles**

**Add up the total number of water bottles! How much water did your household use in the bathroom today?**

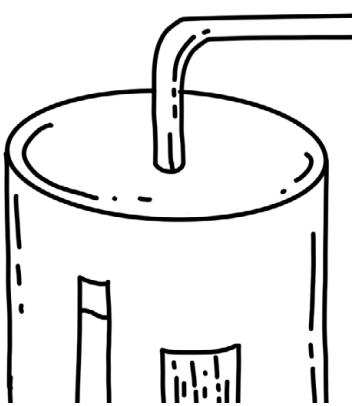
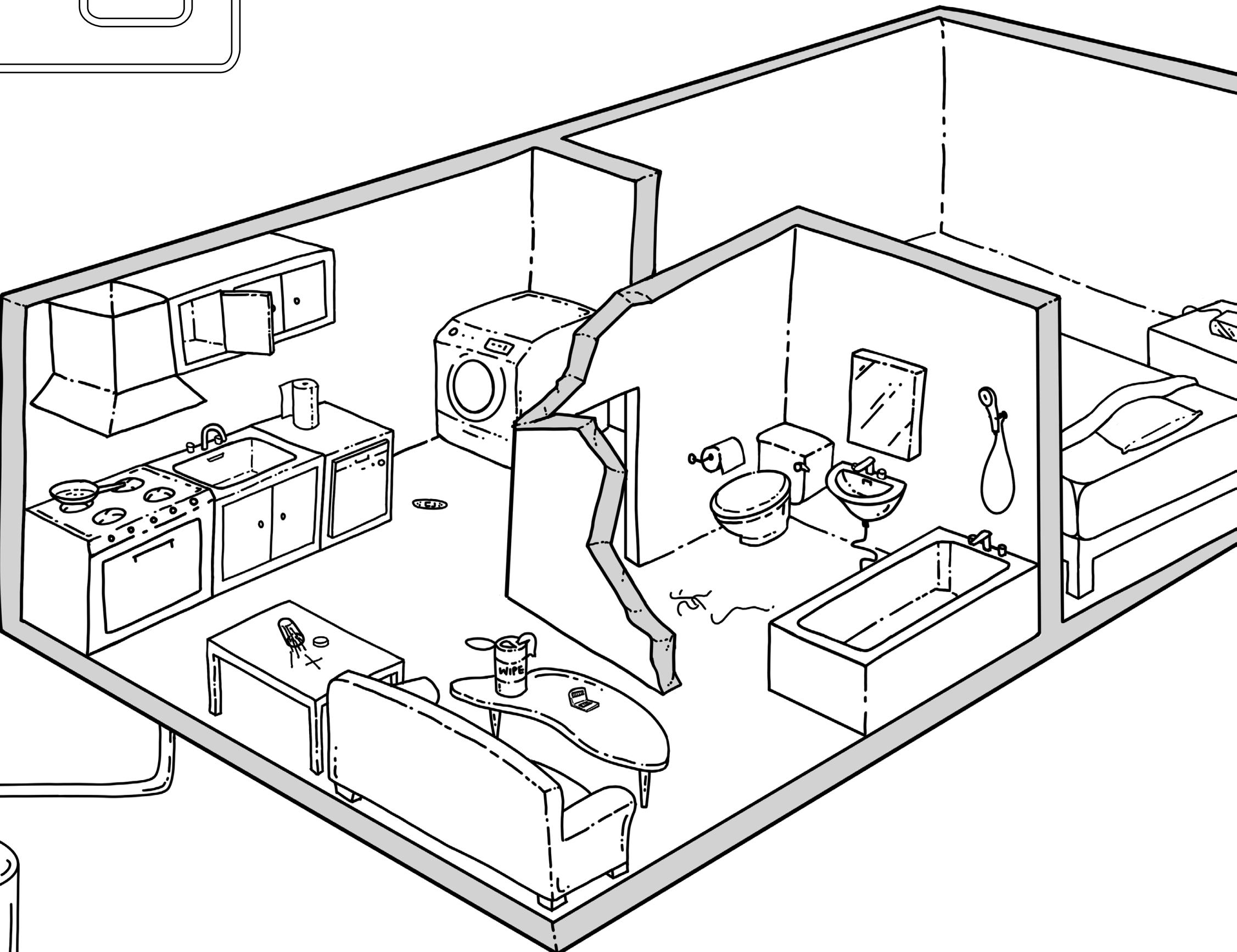
**total water bottles**

# FIND THE WATER

There are a lot of places where water is used in the typical home. **Can you find all eight appliances that use water in this drawing? Color them in!**

There are many domestic pollutants that shouldn't go into our wastewater, yet often do. These commonly enter the wastewater system via toilets and sinks, and can cause blockages or damage to your home's plumbing system as well as the local water resources in Pittsburgh. Try to remember to dispose of these properly next time! **Can you find all seven common pollutants? Color them in!**

Need a hint on what to look for?  
Turn the page and check out the  
list of water appliances and water  
pollutants on page 11.



# WASTEWATER POLLUTANTS



**paper towels**

Paper towels do not have the same characteristics as toilet paper and do not disintegrate easily down the sewer line.



**wipes**

Wipes are not decomposable like toilet paper, and can lead to blockages in the sewage system.



**cotton swabs**

Cotton Swabs don't break down quickly, and can block drains.



**hair**

Hair can form giant balls which create massive blockages and also trap unwanted odors in your plumbing.



**cooking grease**

When fat solidifies, it becomes hard as a rock, blocking the system.



**gum**

Gum can act like glue, and gets stuck in the pipes, causing blockages.



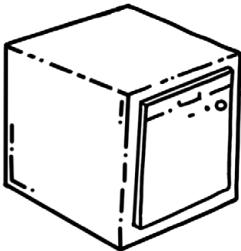
**bandages**

Bandages are primarily made from non-biodegradable plastic, and won't break down in water.

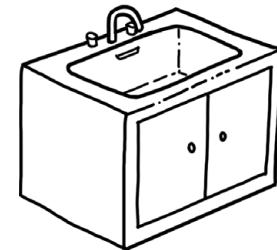
# WATER APPLIANCES



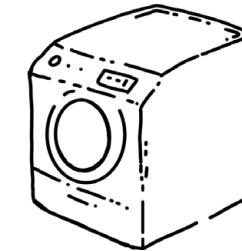
**showerhead**



**dishwasher**



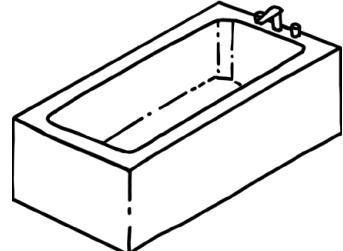
**kitchen sink**



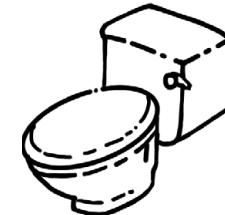
**washing machine**



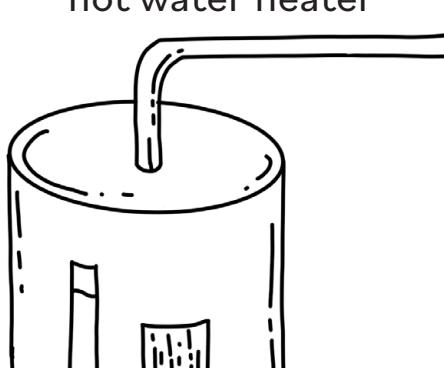
**bathroom sink**



**bathtub**



**toilet**



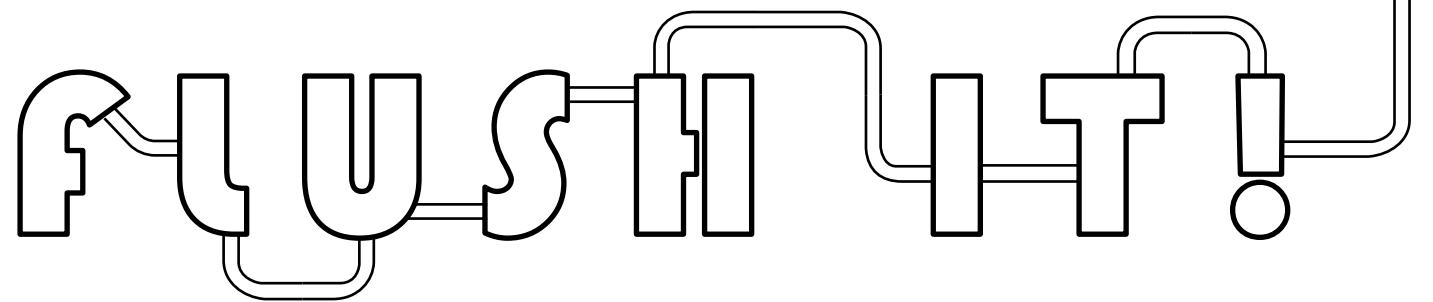
**hot water heater**

# TRY IT OUT AT HOME!

Take pictures of the appliances that use water in your home. Note them or draw them here. How many do you have? Do you know what they all do? What do you use the most?

Now that you know about some common pollutants that go into our wastewater systems, try to collect all of the pollutants you can find in your home! What do they look like? Why do you think they are bad for our water system? Talk with your family or friends to see how you can treat your wastewater better in the future.

Share pictures of your own water sources and water pollutants on social media with the hashtag **#H2OME.CMNH**



## CMNH EDITION

Find your way through the maze to see the geographical path that wastewater travels, from the Carnegie Museum of Natural History (CMNH) to ALCOSAN.



### What is "Flush It!"?

Flush It! is an interactive demo for users to explore how far and where the wastewater from a specific address goes before getting to the ALCOSAN treatment facility.

[flush-it.civicmapper.com](http://flush-it.civicmapper.com)

Our wastewater often travels a long and complicated path before reaching its final destination at ALCOSAN, where it is treated and cleaned before it is returned to the region's waterways. Because Pittsburgh sits at the junction of three rivers, protecting our waterways is fundamental to our daily lives.

### Did you know?

Wastewater from the CMNH travels **67,583.73 feet (12.80 miles)** through the sewer network before reaching the ALCOSAN treatment facility.

It takes anywhere between **9 hours - 19 hours** to reach the treatment plant!

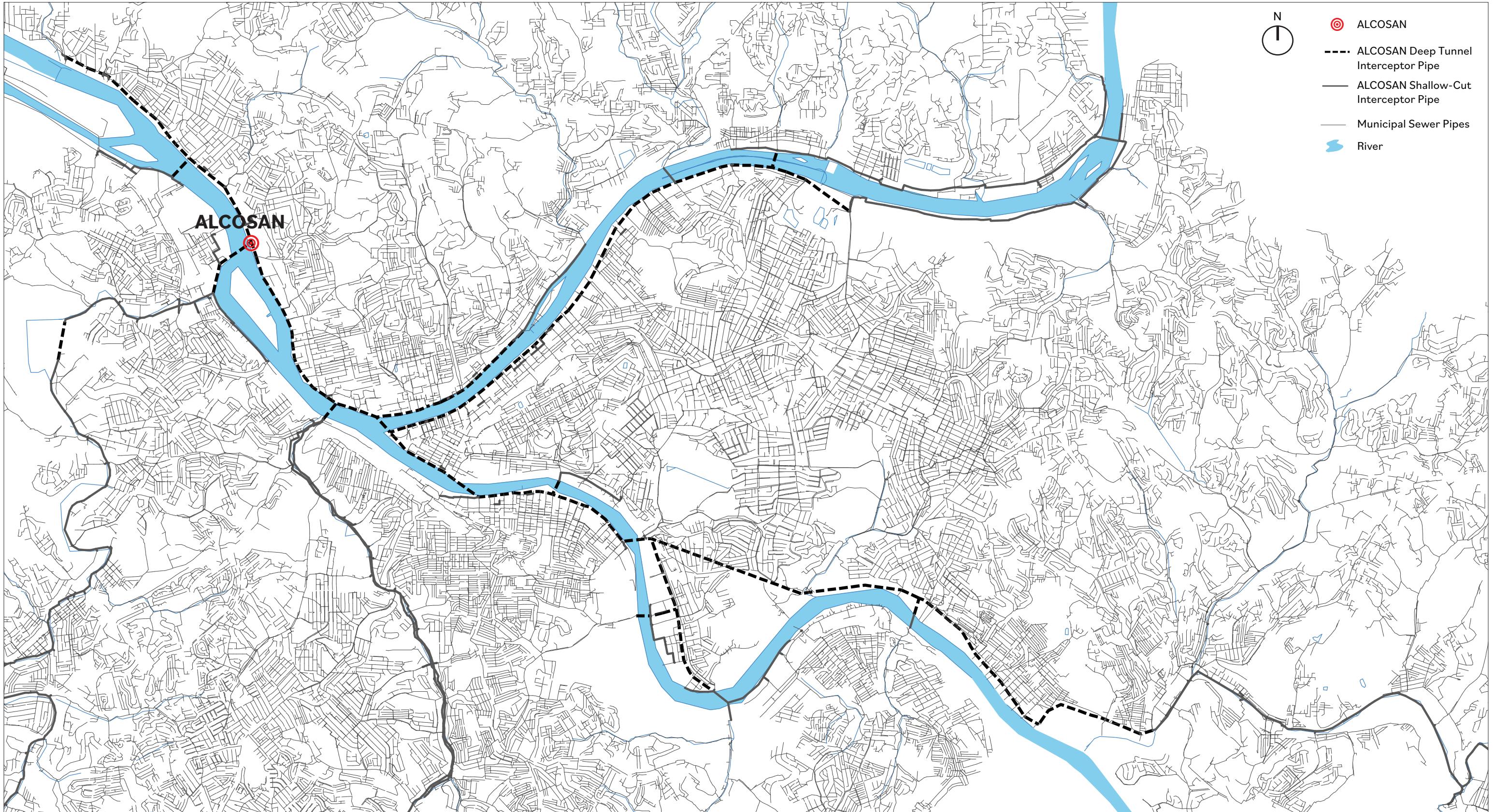
### CMNH's flush passes through pipes in these communities:

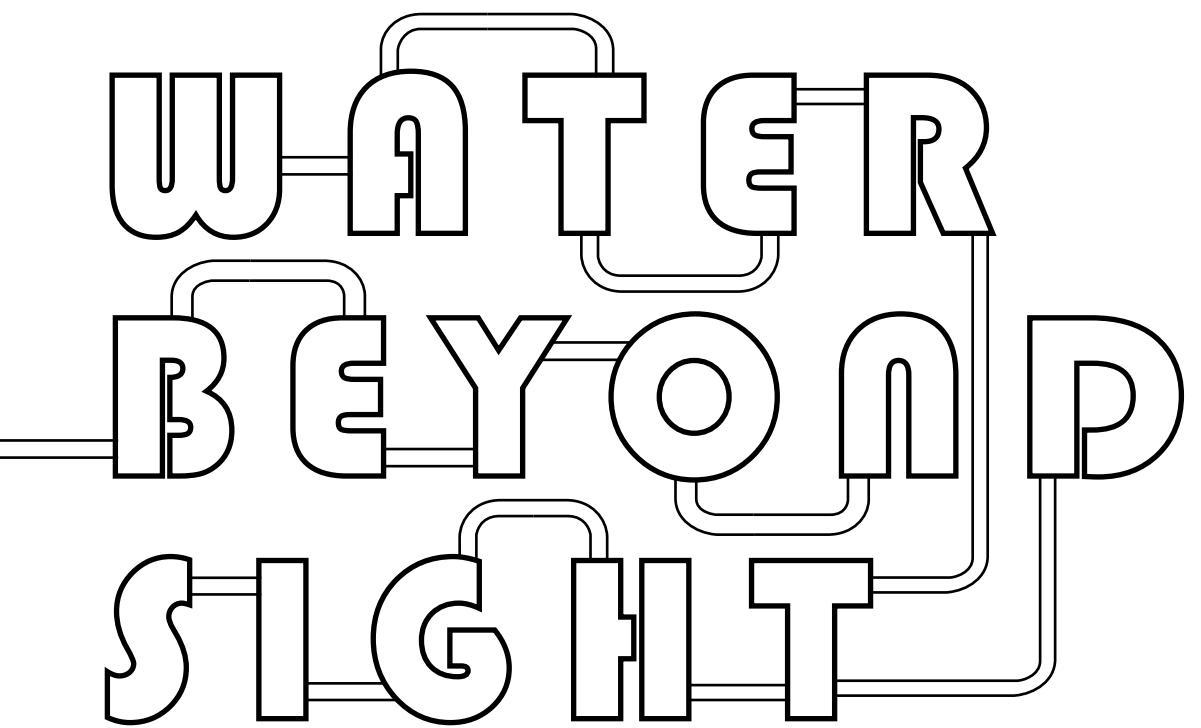
Marshall-Shadeland  
South Side Flats  
Hazelwood  
Central Business District  
Chateau  
South Oakland  
Central Oakland  
North Oakland  
Squirrel Hill South  
Greenfield

# TRY IT YOURSELF!

This map shows the sewer infrastructure network in the ALCOSAN service area. With your family or friends, use the Flush It! online tool to see the path of your wastewater; from your home, to ALCOSAN. Use a coloring utensil to trace the path here!

[flush-it.civicmapper.com](http://flush-it.civicmapper.com)





There are many hidden systems within our water resources, from underwater water and sewer lines, to infrastructure designed to manage our stormwater. Water serves as an integral part of our everyday lives, and it is critical that we learn about our local water story. Use the words below to complete the crossword puzzle.

PWSA

ALCOSAN

OHIO

# RAIN GARDEN

## GREEN ROOF

ALLEGHENY

## MONONGAHELA

PERMEABLE

# RAIN BARREL

HIGHLAND

BIOSWALE

GREEN STREET

## **ACROSS - Green Infrastructure**

1. This green infrastructure collects rainwater from the roof of homes and captures it for later use.
  3. A \_\_\_\_\_ pavement is one that catches and filters rain and water from runoff.
  4. This green infrastructure covers the top of a building with vegetation to primarily absorb rainwater.
  6. This green infrastructure features an area, usually placed near homes, with vegetation that collects and soaks water into the ground.
  8. This green infrastructure strategy incorporates vegetation and other stormwater management elements in places where cars run or pedestrians walk. They are designed to capture rainwater at its source, and often involve bioswales, rain gardens, and permeable pavement.
  10. This green infrastructure is a shallow, open channel that reduces water runoff by infiltration.

**DOWN - Pittsburgh Water Infrastructure**

2. The name of the sewage treatment plant that filters the wastewater from your bathtub, toilet, and sinks.
  5. The name of the river that runs from Pittsburgh to New York and flows alongside Pittsburgh's sports stadiums like Heinz Field and PNC Park.
  7. The name of the river that usually is a shade of brown and provides hydroelectric power to cities along its banks.
  9. The \_\_\_\_\_ Park Reservoirs supply 20 million gallons of water per day and remains the only open-air reservoir in the city.
  11. The name of the river that is formed by the convergence of two rivers in Pittsburgh but has been ranked one of the most polluted rivers in the United States.
  12. Initials of the service that handles Pittsburgh's water treatment and sewer systems.

A blank crossword grid consisting of a 12x12 grid of squares. The grid contains several numbered squares and empty boxes. The numbered squares are:

- 1: A single square at the top left.
- 2: A horizontal row of six squares below square 1.
- 3: A single square in the middle column.
- 4: A vertical column of four squares on the right side.
- 5: A horizontal row of six squares below square 3.
- 6: A vertical column of three squares on the far left.
- 7: A vertical column of four squares below square 5.
- 8: A vertical column of three squares next to column 7.
- 9: A horizontal row of seven squares below square 6.
- 10: A vertical column of four squares on the far right.
- 11: A vertical column of three squares next to column 10.
- 12: A horizontal row of four squares at the bottom center.

The remaining squares are empty boxes for the crossword puzzle.

# LEARN MORE ABOUT PITTSBURGH'S WATER STORY

**ALCOSAN** provides wastewater treatment services 24 hours a day, seven days a week.

[alcosan.org](http://alcosan.org)

**3 Rivers Wet Weather** (3RWW) is a nonprofit environmental organization created to address the Pittsburgh's wet weather overflow problem.

[3riverswetweather.org](http://3riverswetweather.org)

**Pittsburgh Water and Sewer Authority** (PWSA) is responsible for water treatment and delivery systems in the city of Pittsburgh

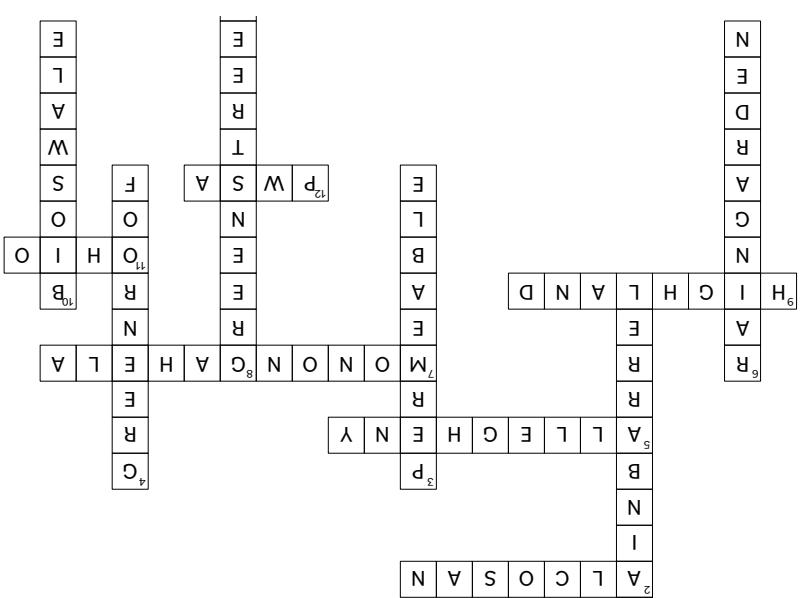
[pgh2o.com](http://pgh2o.com)

**Pittsburgh Collaboratory** is a platform where community and science meet to improve and sustain regional water resources, incorporate science into decision making, respond to community needs, and cultivate future water leaders.

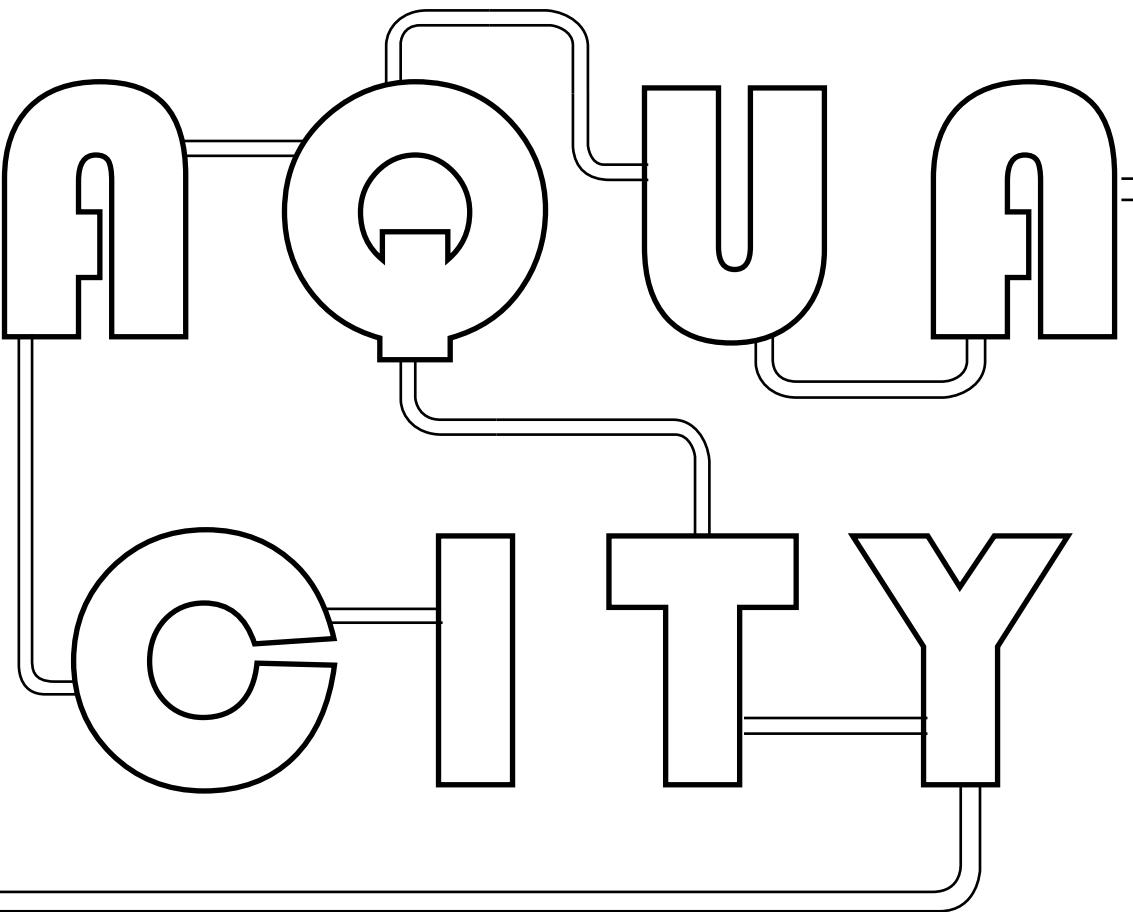
[water.pitt.edu](http://water.pitt.edu)

## KEEP YOUR EYES OPEN!

Pittsburgh is full of water infrastructure! All you need to do is look; next time you take a walk or go on a drive somewhere, keep your eyes open and look for things like green infrastructure elements or hints of water/sewer lines.



Cut out page here



You've been voted as the mayor of Aqua City! Your first task is to help design and develop two empty blocks in the city center. As the new mayor, part of your duty should be to improve the way water is handled in the city. Try to be more water-conscious and water-sustainable, and use this activity to learn about the cause and effect of home and city infrastructure.

Feel free to color and decorate the Aqua City components as you see fit!

# INSTRUCTIONS

1. Cut out pages 20-27.
2. Decorate and cut out the individual infrastructure components that will be used to customize the new blocks. Additionally, decorate and cut out the individual building components where people will live and roam in your city.
3. On the map (pages 29 and 30), arrange the buildings and infrastructure components on the two empty blocks of the map. Pick and choose the elements that you'd like to include as new mayor. Don't forget that Aqua City should be water sustainable, so try to choose infrastructure components that will make your city beautiful as well as aqua-friendly. Check out the Aqua City Index to see what each infrastructure component can do for your city.
4. Finally, check how environmentally friendly your city's water-planning is by calculating your points using the Score Sheet. A higher score means your city is more water-conscious and water-sustainable!
5. Show us how you did by taking a picture of your city and sharing it on social media with **#H2OME.CMNH**

Cut out page here

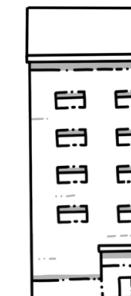
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# AQUA CITY INDEX

## Included in your Aqua City Kit:



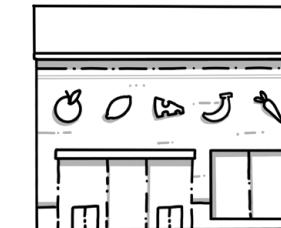
House (x7)



Apartment Building (x3)



Hospital (x1)



Grocery Store (x1)

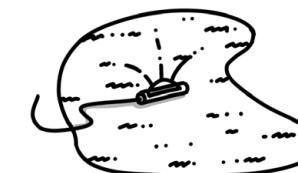


Library (x1)



Rain Barrel (x6)

*Attach any number of Rain Barrels to any building to collect rainwater.*



Lawn Sprinkler (x5)

*Place a Lawn Sprinkler near any house or apartment building to keep the grass watered and green.*



Rain Garden (x5)

*Place a Rain Garden near any building to collect and absorb surrounding stormwater.*



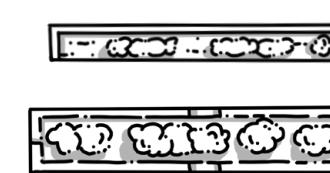
Permeable Street Paving (x2)

*Place a Permeable Street Paving on top of any existing street to improve its water retention and runoff quality.*



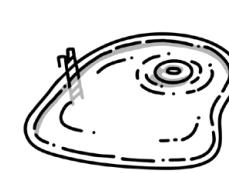
Flower Garden (x5)

*Place any number of Flower Gardens near any buildings.*



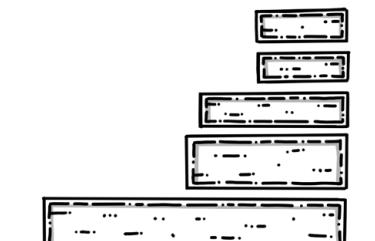
Bioswale (x4)

*Use a Bioswale near a street or sidewalk to collect and filter stormwater from paved areas.*



Pool (x6)

*Place a Pool near a house or apartment building to provide a recreational water activity.*



Green Roof (x6)

*Replace the roof of the grocery store, hospital, or an apartment building with a Green Roof to absorb rainwater. Make sure you use the right size roof for each building!*



Fountain (x4)

*Place a Fountain anywhere to create a city water attraction.*



Fish Pond (x3)

*Place a Fish Pond anywhere to create a city water attraction.*



Car (x7)

*Place a Car on any street. Be aware that cars can create pollution in stormwater runoff!*



Bench (x8)

*Place a Bench anywhere to provide a great outdoor sitting area.*

# SCORE SHEET

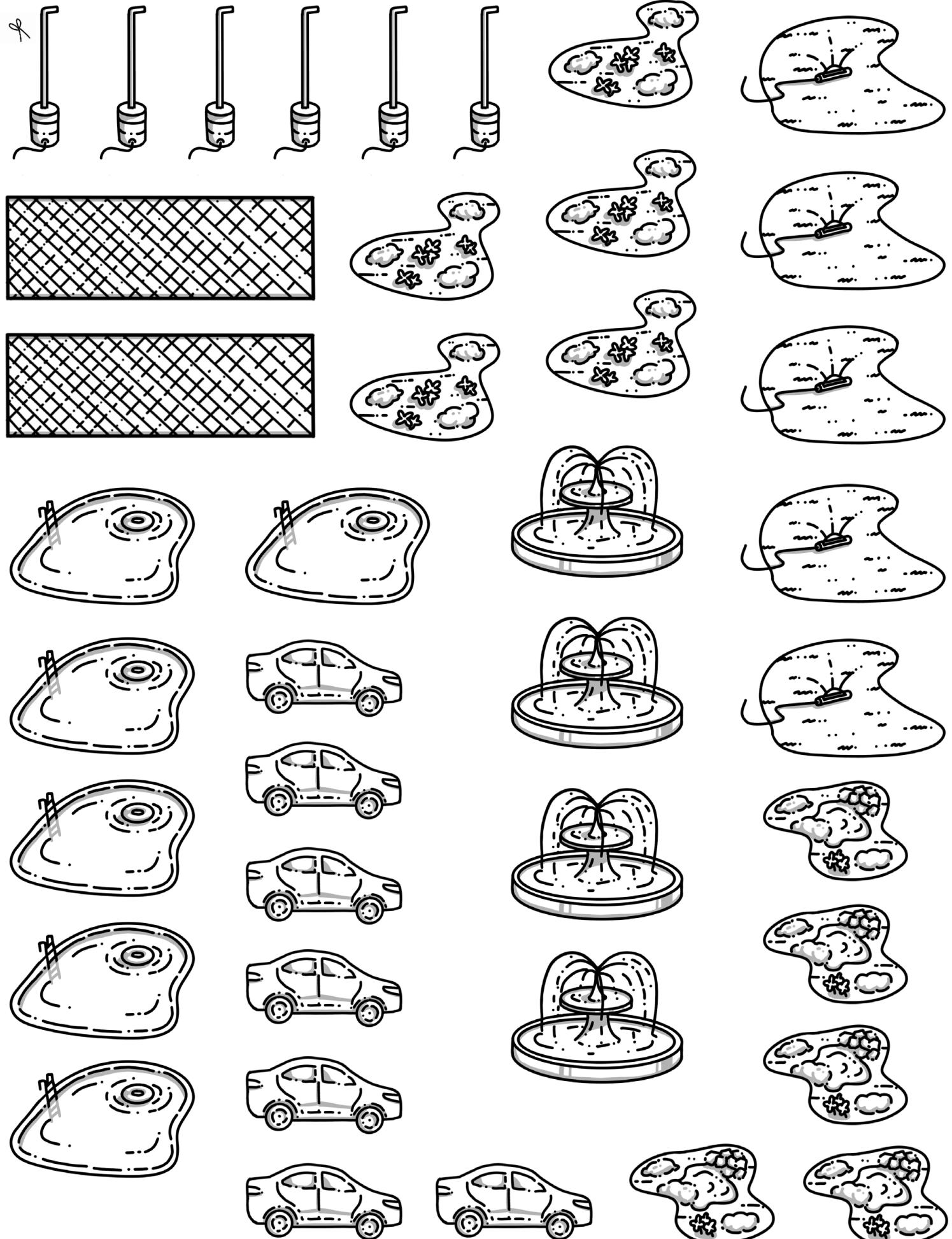
Use the Score Sheet to calculate the score of your city. How did you do?

What are ways you can improve your score? Feel free to rebuild your city, then recalculate your score. A higher score means your city is more water-conscious and water-sustainable!

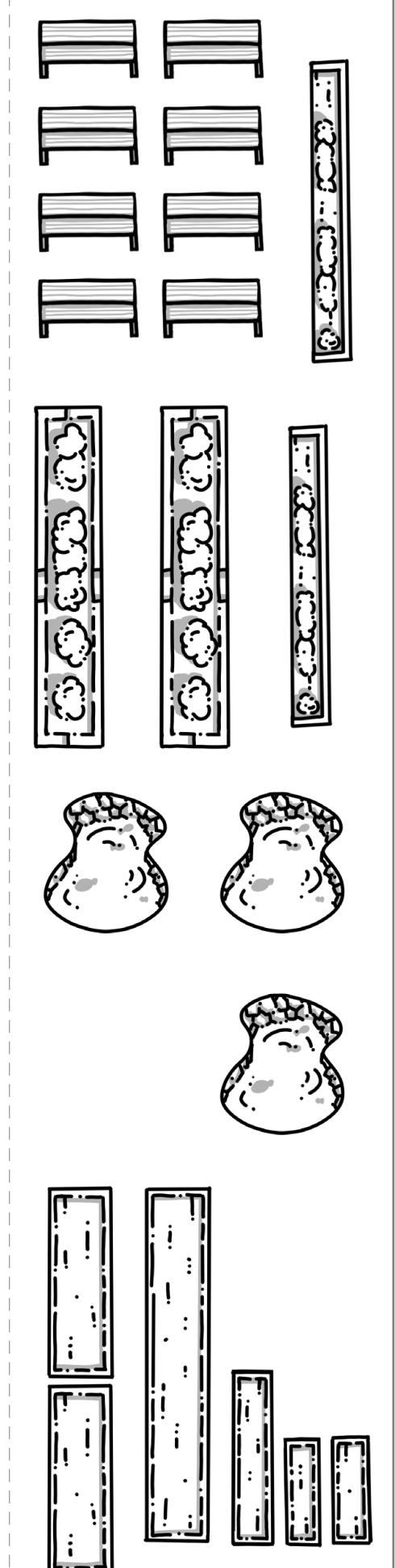
<b>Component</b>	<b>Points</b>	<b>Your Quantity</b>	<b>Points Subtotal</b>
Bioswale	2	X	=
Permeable Street Pavement	2	X	=
Rain Garden	1	X	=
Green Roof	1	X	=
Rain Barrel	1	X	=
Flower Garden	0	X	=
Bench	0	X	=
Car	-1	X	=
Fish Pond	-1	X	=
Lawn Sprinkler	-1	X	=
Pool	-1	X	=
Fountain	-2	X	=

**TOTAL SCORE**

Cut out individual components from this page!



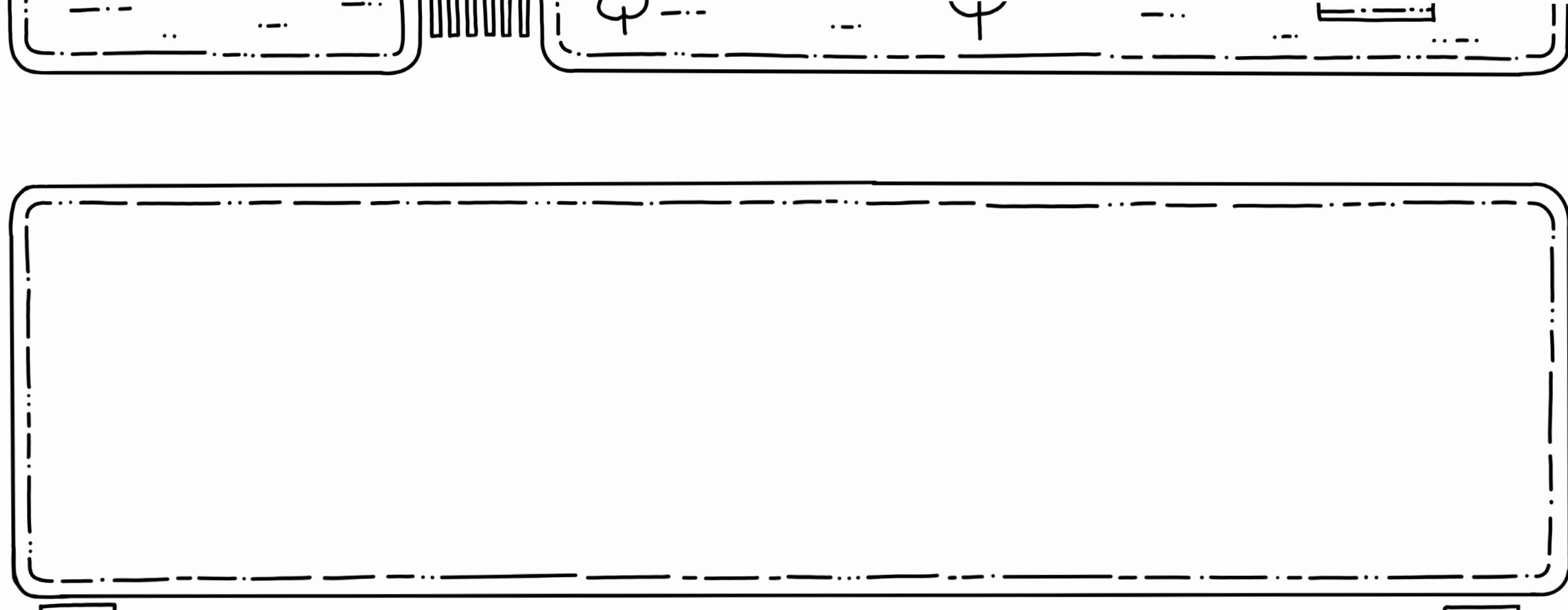
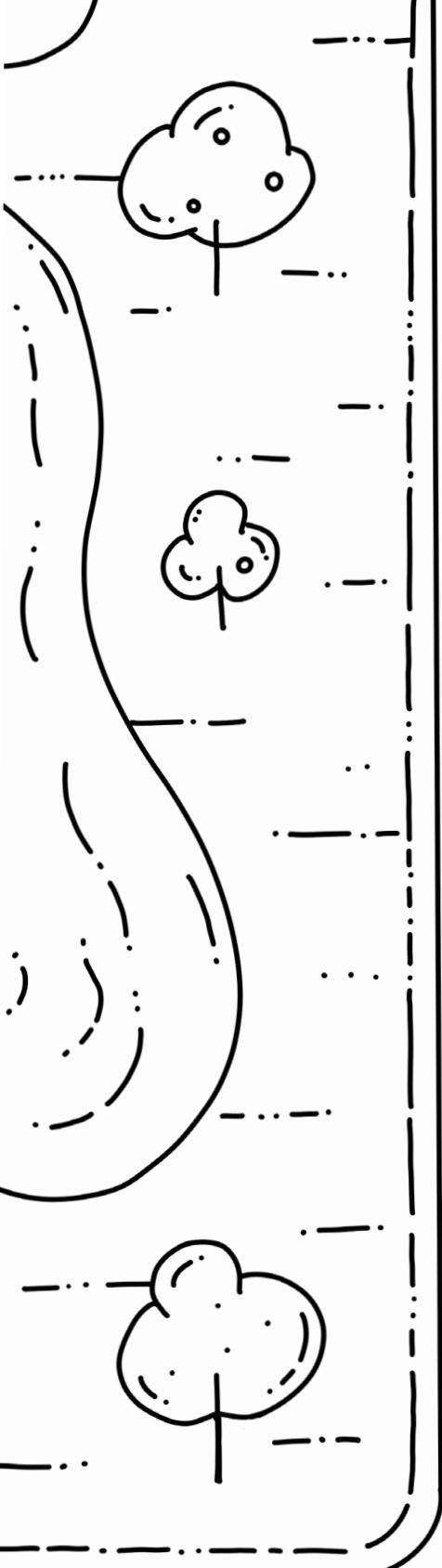
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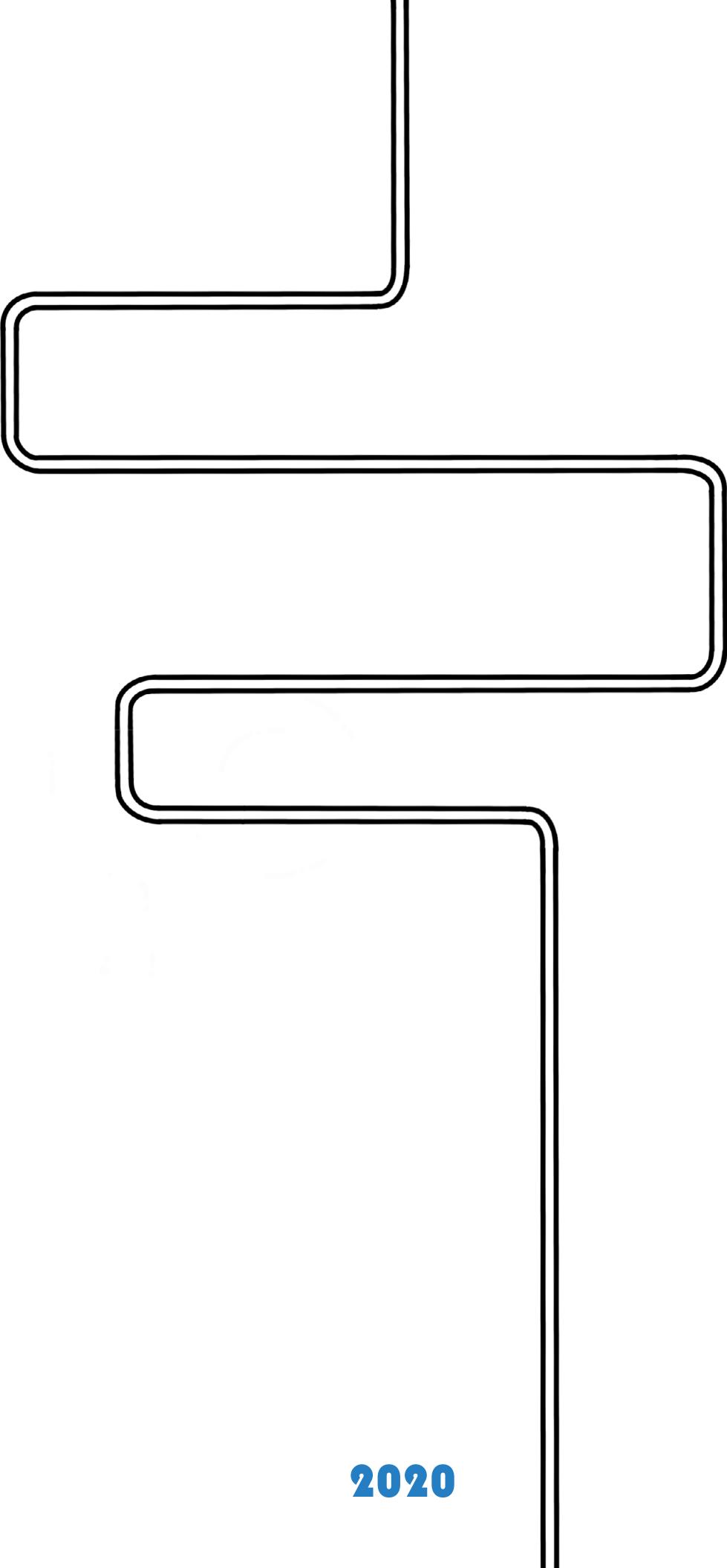


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