Bryn Mawr College

Green Stormwater Infrastructure Projects in The Philadelphia School District

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Executive Summary
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The School District of Philadelphia (SDP) recognizes the multi-faceted benefits of installing green stormwater infrastructure (GSI) systems in schoolyards as a part of their GreenFutures Sustainability plan. As a result, the SDP has implemented a significant number of GSI projects, with 38 active installments and 9 in-progress plans. We have been working with the SDP on three key deliverables. (1) In a spreadsheet format, calculate and summarize in a report how many gallons of water is captured by SDP projects (38) on average per year. (2) Propose an itemized cost list of monitoring equipment tools for three budget scenarios: low, medium, and high. (3) Develop a communication strategy for school administration and faculty that identifies the benefits of integrating findings into the FWW Middle grades Understanding the Urban Watershed curriculum. Our field work supervisor has been Ellen Schultz, Director of Education Partnerships at the Fairmount Water Works Interpretive Center.

GSI systems are nature-based systems of stormwater management that increase infiltration of precipitation during storm events. By decreasing stormwater runoff during rain-events, GSI systems help to decrease flooding and contamination of nearby aquatic systems. We were able to calculate the yearly system capture of the majority of the GSI systems in the SDP. In order to do these calculations, we used the storm-event precipitation data from 2020, we assumed that the storm size was the same across all of the systems (1.5in.), and we identified the drainage area of each system. Emma Melvin, an engineer from SDP, provided us with information for most of the systems, 31 out of the 38 GSI systems in the SDP, and advised us to use the following equation:

$$System\ Capture\ (CF)\ =\ drainage\ area\ (SF)\ *\ yearly\ precipitation\ (ft)$$

We found that the system capture for 31 GSI systems in the SDP was 88 million gallons of water, the equivalent of 133 Olympic-sized swimming pools. Our recommendation to

complete the findings is to gather data from the remaining 7 systems we could not find information on.

Using the Harding Middle School site as a prototype, we identified the set of equipment needed to monitor the real-time calculation of GSI system capture. We met with Craig Johnson at Interpret Green regarding his sensor work and learned that we need to use simple but effective solar powered and cellular connected technologies that allow for real time measurements of stormwater capture. We are proposing to mount a weather station equipped with a camera and moisture sensor at the Harding Middle School site. The camera will take 5 minute interval snapshots of the measuring meter mounted on the ground.This will give us information on infiltration and the amount of rain that fell in real time. The cellular connected camera, moisture sensor and mini weather station to monitor stormwater capture will cost us $1395.

Next developed a plan for students to use the data that will be generated from the proposed systems at Harding Middle School. We used the preexisting “Understanding the Urban Watershed" curriculum, created by Fairmount Water Works for Philadelphia Public Schools, as a starting point. The curriculum already included an activity where students design GSI systems for their schools. However, in schools with GSI systems and data about the water capture of the GSI systems, we believe that this activity can be expanded. Students can look at the data from the current GSI system and make recommendations for improvements. This activity will encourage creativity, while also getting students more comfortable around reading and understanding data. Since it would be relatively cheap and easy to add additional types of sensors, we could give teachers the opportunity to add in lessons about air quality or temperature.

We found that the system capture for 31 GSI systems in the SDP was 88 million gallons of precipitation. We were able to propose a camera, weather station and sensor system for monitoring GSI system capture and propose for students to engage with this data and suggest areas of improvement. In a nutshell, our work is contributing to sustainable water management and helps young people be involved in stormwater management through modifications to the curriculum.