

Developing Credits and Incentives for Innovative Stormwater Management

Collaborative Learning Group Meeting

August 20, 2014, 9:00am-3:30pm

Site visit of Old Woman Creek NERR pervious pavers

Meeting held at Old Woman Creek NERR Mike DeWine Visitor's Center

Meeting Summary

Collaborative Learning Group (CLG) Members Present: Dan Bogoeviski (Ohio EPA), Anthony Dietrich (University of Toledo), Eric Dodrill (Erie SWCD), Alexander Etchill (John Hancock & Associates), Ken Fortney (Erie County) Clyde Hadden (CT Consultants), Robert Hare (John Hancock & Associates), Dave Ritter (NEORS), Rachel Webb (NEORS), Betsy Yingling (NEORS)

Project Team Members & Staff Present: Kristi Arend (OWC NERR), Keely Davidson-Bennett (CRWP), Jay Dorsey (ODNR), Crystal Dymond (Erie SWCD), Heather Elmer (CRWP), Ona Ferguson (CBI), Kevin Grieser (Biohabitats), William Hunt (NCSU), Rebecca Jacobson (UNH/OWC NERR), Frank Lopez (OWC NERR), Ryan Winston (NCSU), Cheryl Wolfe-Cragin (OWC NERR)

Next Steps

- Project Team – Develop and send CLG participation certificates
- Everyone – Provide feedback on draft OWC NERR case study
- Project Team - Consider developing an ongoing “Frequently Asked Questions” list with compiled answers from project team and/or CLG to facilitate ongoing communication when CLG meetings are less frequent.
- Project Team – Form a credits work group. Volunteers: Eric Dodrill, Crystal Dymond, Dan Bogoeviski, Clyde Hadden.

Welcome, Introductions, and Meeting Overview

Keely Davidson-Bennett and Ona Ferguson welcomed everyone to the meeting and gave an overview of the meeting agenda. Participants introduced themselves. Materials from the meeting, including presentations and this meeting summary can be found at the project website:

<http://crwp.org/index.php/projects/research-projects/nerrs-science-collaborative>.

Site Visit: Old Woman Creek NERR Pervious Pavers

Frank Lopez presented a brief overview of the project history, and Ryan Winston shared construction pictures and described the construction process and monitoring design. Ryan and Frank then led CLG members on a site tour.

The OWC NERR site consists of a 2,900 ft² Permeable Interlocking Concrete Pavement (PICP) parking lot and rainwater harvesting system. It was completed in mid-July. Ryan gave an overview of the monitoring equipment, sampling plan, and rainwater harvesting system. Frank displayed the engineering plans and gave an overview of site history, design, and construction. Prior to construction, there was a

grass pave system next to the existing asphalt parking lot. Within a year of installation, the grass pave system was ineffective and not aesthetically pleasing, so OWC guests weren't parking there.

The site is being monitored for water quality, flow, temperature within the aggregate and the cistern, and weather conditions. Two auto samplers, an automated rain gauge, and a weather station were installed. Ryan opened the catch basin and explained the drainage infrastructure including the underdrain and overflow tiles, and V-notch weirs used to reduce water flow and enable an auto sampler. Most of the water analyses will occur on-site. One of the manhole covers was removed so CLG members could see down into the cisterns. The spigot was unlocked to show the water pressure generated by the pump inside one of the cisterns.

People asked about why the site was redesigned from porous asphalt to permeable pavers. It was difficult for OWC staff to get contractor bids and quotes from this part of Ohio for permeable pavers, since few local or regional professionals really know about porous asphalt and asphalt mixture specifications or have significant experience using required installation equipment. The small scale of the parking lot (less than 20 cubic yards) and the lack of a local asphalt batch plant caused the cost of the project to come in at over \$40 per ft², far higher than the budget allowed. In addition to cost, there are maintenance opportunities with pavers that made them attractive when compared with permeable asphalt: if there are issues with the pavers, they can be individually replaced (whereas the entire porous asphalt surface would need to be replaced).

Ryan and Frank shared lessons from the project. Among them, Frank said that having the design engineer (Ryan) on site for the majority of construction was great because Ryan was able to make in-field modifications real-time if challenges arose, interacted with the construction contractor, and assisted with scheduling when donated components weren't arriving on time. The construction contractor appreciated the construction design and sequence steps on the engineering plans and notes. A few changes were made during construction, including the addition of a 6" curb reveal instead of bumper blocks. OWC NERR used different colored pavers for the parking stall lines instead of paint. Overall, Frank and other Reserve staff are very pleased with how the pavers turned out so far.

Frank views the pervious parking lot as an educational opportunity for visitors. He is interested in adding an informational sign and interactive component where visitors can pour water buckets on the pavers to see how they work. The day before the CLG tour, the Berlin Township Fire Department came with a fire engine and dumped 1,000 gallons of water in 1.5 minutes on the pervious paver parking lot. This demonstration was captured on video and can be viewed at:

https://www.youtube.com/watch?v=tMCzrD_H5R4. Another educational and environmentally responsible possibility would be to connect the rainwater harvesting system to the visitor's center for a toilet grey water system. Kristi Arend, Research Coordinator for the Reserve, said this is a goal and that Reserve staff are hoping to incorporate that into a larger facility upgrade when funds are available. Currently, cistern water is being used for irrigation and educational demonstrations. The vault was full the day of the site visit.

Monitoring Results

Ryan Winston presented monitoring results to date from the LID systems installed through this project. Over the monitoring period, the permeable pavement applications at Perkins Township, Willoughby Hills, and Orange Village have reduced runoff by 20 - 50%. Data from water table wells indicate that 7.5 - 14% of rainfall volumes are infiltrating into the subgrade. At all three sites, permeable pavement effectively reduces median peak flow rate by at least 70%. Observations of drainage rates suggest that underdrains limit outflow to 0.1 - 0.15 cfs, which is the main factor that causes peak flow mitigation. For infrequent return interval storms, peak inflow was nearly equal to that of peak outflow.

Ryan also presented results of quarterly surface infiltration testing to determine permeable pavement maintenance needs. Infiltration tests at Orange Village and Perkins Township indicate that maintenance is not yet needed. In contrast, the permeable paver surface at Willoughby Hills clogged in July to the point where surface runoff occurred into the catch basin. In August, the parking lot was vacuumed, which successfully restored its infiltration capacity (view video at <https://www.youtube.com/watch?v=INFLUN9nyfo>). CLG members expressed disappointment that clogging had occurred so quickly at this site and concern that many site owners would not maintain permeable pavement. Ryan replied that designers could stick closer to 2:1 loading ratio to minimize maintenance needs. CLG members also discussed the possibility of only targeting the clogged areas for maintenance and using a smaller machine.

The monitored bioretention cells are effectively reducing peak flow and outflow volume. The curve numbers for the bioretention cells at Holden are 83 and 87. These compare well against the expected curve number of 90.5 for the untreated watersheds. After normalizing for watershed area, there was no difference in volume reduction between the cell planted with woody vegetation and the one with herbaceous vegetation after the first nine months of growth. CLG members commented that bioretention areas can be very attractive if well maintained.

Modeling Update

Jay Dorsey presented the work he has been doing to use SWMM modeling results to evaluate a potential peak discharge credit mechanism for the critical storm method. Communities could allow for subtracting the runoff volume controlled by the LID SCM from the post development runoff volume when determining the critical storm that must be controlled. SWMM modeling results indicate that for permeable pavement on D soils with a 3 inch sump and a drainage area ratio of 25% on a site that was in agricultural land use before development, crediting the volume reduction of the permeable pavement would reduce the critical storm from the 5 year storm to the 1 year storm. One CLG member commented that communities regulated under the Ohio EPA Phase II stormwater program need to update their stormwater codes within the next two years and if we wanted to incorporate this crediting mechanism into their codes, a product is needed soon.

Bill Hunt reported on progress on developing a DRAINMOD model of the Perkins Township pervious concrete site. The model has been built and calibrated using 2013 data and will be validated using 2014 data. A DRAINMOD model has also been calibrated and validated for a permeable pavement installation in Boone, North Carolina. Those model predictions correlated well with the validation data. NCSU will be building, calibrating, and validating DRAINMOD models for other permeable pavement and

bioretention sites monitored through this project. NCSU will use those model results to develop a spreadsheet-based tool for predicting the fate of runoff from permeable pavement. One CLG member commented that it would be great to get to a point where we could agree on which models predicted the performance of each SCM the best especially if user-friendly spreadsheet tools were based on those models so that performance expectations could be standardized rather than having different consultants getting different results using different models.

Applying Project Results

Heather Elmer asked the CLG to provide feedback on four potential training ideas: workshops on (a) research results, policy implications and additional research needs, (b) permeable pavement design, (c) bioretention installation or (d) permeable pavement installation. CLG members indicated that they thought permeable pavement design and installation trainings were needed the most. CLG members commented that maintenance should be a bigger component of trainings and that maintenance and constructability should be part of any training for design. One CLG member said that policy recommendations from this project should be concrete and present how policy changes would affect consultants, plan reviewers, and other relevant parties. For contractor trainings, CLG members suggested seeking contractor input when planning these trainings, coordinating with trade organizations, trying to tie trainings into their certification process, and having an active construction project to visit. A CLG member suggested that it might also be possible to create a certification process similar to North Carolina's (certifying comfort with LID design or installation) independent from any particular industry program. CLG members had mixed reactions about whether online trainings would be useful as compared with in person trainings.

Heather also asked the CLG about tools that could be created through this project. One idea was to update NCSU's Rainwater Harvesting tool with Ohio climate data. Multiple CLG members thought this would be useful. Some suggested that Ohio is having trouble figuring out the legalities of using captured rainwater for indoor use. Bill Hunt suggested that it might be useful to look at North Carolina or another humid state's guidance. Brief training videos are another potential tool that could be created. CLG members thought that editing video clips for training would generally not be worthwhile, because industries already have similar footage available on their websites. However, at least one person was interested in video clips that illustrated when maintenance was needed.

General Business

Crystal Dymond reported that the City of Sandusky adopted stormwater management and erosion and sediment codes on July 14, 2014. CLG members requested that they have an opportunity to review project results before they become publicly available, so there will be a results roll out meeting for the CLG in spring 2015.

CLG Member Final Reflections

All meeting participants had the opportunity to share final reflections on the project, since this was intended to be the final CLG-only meeting. Most commented that they think the data generated

through this project is very useful. Several people mentioned that the group worked well together. Members expressed pride in being involved with the project, in their accomplishments as a group, and in producing useful deliverables. A couple of people mentioned that this project is significant not only to northern Ohio but also on a national level. One person said that our Science Collaborative project helped the University of Toledo launch a stormwater monitoring program. A few others noted that the project was important for increasing acceptance of LID in the region. Keely thanked everyone for their participation throughout the project, and Ona acknowledged Amy Brennan's role in spearheading this project until May 2014.