

2014 Green Infrastructure Webcast Series – More Bang for the Buck: *Integrating Green Infrastructure into Existing Public Works Projects*

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Speakers:

- **Eva Birk**, ORISE fellow, EPA's Green Infrastructure Program
- **Charlotte Katzenmoyer**, Director of Public Works, City of Lancaster, PA
- **Matthew Millea**, Deputy County Executive for Physical Services, Onondaga County, NY

Transcript:

Slide: More Bang for the Buck: *Integrating Green Infrastructure into Existing Public Works Projects*

Eva Birk

Integrating Green Infrastructure into existing public works projects and this webcast is sponsored by EPA's Green Infrastructure Program and the Office of Wastewater Management. My name is Eva Birk, and I'm an ORISE fellow with EPA's Green Infrastructure Program. And I will be moderating today's webcast along with my colleague, Emily Ashton. Thank you for joining us.

So before we get started with our presentations, I'd like to go over a few housekeeping items. First, we will have a question and answer session after each of today's presentations.

Slide: Logistics

And if you'd like to ask a question, simply type a question into the "Questions" box on your control panel and click the "Send" button. That means that we here will see it in the control room. And if your control panel is not showing, just click the small orange box with the white arrow to expand it, and then you'll have the ability to chat with us. And now, you don't need to wait to the end of each presentation and when we start the question and answer period to submit your questions. There are a large number of participants on the line today, so we actually encourage you to submit your questions early on and whenever they come to you during presentations. So we will try to answer as many questions as possible, but, however, due to the high number of participants, not all questions will be answered.

So in case your question does not get answered, please feel free to contact the speakers after the webcast. We'll have their presentation info and their speaker contact information both online and on the last slide of this webcast later today. So if you have any technical issues, such as audio problems, please click on the "Questions" box again to the right of your screen and type your issue and press the "Send" button, and we will do our best to troubleshoot. You can also call the GoToWebinar hotline at 1-800-263-6317 and give them your conference ID number listed on the screen. And lastly, we'd like to remind you that the views and materials presented by our speakers today are their own and do not necessarily reflect those of EPA.

Slide: Webcast Agenda

So what are we going to be covering today? Today we're going to be talking about "Making Green Infrastructure Business as Usual: A Paradigm Shift." So including green infrastructure as part of city, state, and regional public works projects is one of the most efficient ways to achieve wide-scale and cost effective green infrastructure implementation. This webcast will share lessons learned from municipal and county officials experienced in the art – because it is an art – of coordinating green infrastructure improvements with things like scheduled street improvements, parks improvements, and projects on public sites. And integrating green infrastructure into existing public works projects, as many of you know, and, as well, capital improvement plan projects, can allow different government departments to ID the most impactful and cost effective opportunities for green practices and really get more bang for the buck.

Slide: Now to our Speakers!

So with, that I'd like to kick off today's webcast by introducing our first speaker, Charlotte Katzenmoyer. Charlotte has served as a Director of Public Works for the City of Lancaster since May 2001. She graduated from the University of Akron with a bachelor of science in Civil Engineering and Lehigh University with a master's of science in Environmental Engineering. And as the Director of Public Works, she has responsibility for both the Bureaus of Planning – excuse me, the Bureaus of Engineering and Operations, which means that she is in charge of streets, traffic, parks, public facilities, water, wastewater, solid waste and recycling, and stormwater problems. So she is quite busy. And at this point you might understand that she does have quite the experience with coordinating projects at the municipal level. And the water and wastewater bureaus that Charlotte manages serve ten municipalities and 140,000 residents, with an annual budget of 47 million and a capital budget of 50 million. Ms. Katzenmoyer has published numerous papers and presented across the nation on the city's innovative green infrastructure plan.

And before I hand it over to Charlotte, I also did want to want to make sure that we mention that EPA's Green Infrastructure Program here recently conducted a technical assistance project with the City of Lancaster to evaluate the multiple benefits of their green infrastructure plan. And this case study estimates both the value of several of the co-benefits of Lancaster's green infrastructure plan as well as highlighting the importance of including multiple benefits for green infrastructure in cost benefits analysis, when you do cost benefit analysis, as well as adding green infrastructure into planned improvement projects. So that report is finished, and it's now published and available on EPA's green infrastructure website. So make sure to check that out after the presentation. And with that, I will turn it over to Charlotte.

Slide: Green is the New Color for Stormwater

Charlotte Katzenmoyer

Thank you. I'm glad to be here today to talk about our stormwater program. And when I say that green is the new color of stormwater, I'm not talking about algal blooms. I'm talking about green infrastructure and how we are incorporating green infrastructure into every capital project that we're doing and how we've developed a stormwater utility to help innovation and trying to get retrofits on private property. And I believe that the US needs a paradigm shift, as Eva said earlier, to a new stormwater engineering because I think our stormwater engineering practices have not been as successful as we had hoped since the Clean Water Act was

initiated. And I think we're seeing that as we see more impaired water bodies across the United States. So I think green infrastructure is going to be the new paradigm shift, and we're seeing more acceptance of that in moving to this technology. And why do we see that? I think it's because we see the added benefits and the side benefits of green infrastructure. And I'll talk a little bit about those side benefits and highlight those with some of the projects that we've done around the city. And those side benefits are both social, economic, as well as environmental, and I'll highlight those through my talk.

Slide: The City of Lancaster – Overview

Just a little overview about the city of Lancaster. We're a very old, urban center, and we have about 60,000 residents. So it's a very dense urban center. The 7.34 square miles is kind of misleading. We actually have four square miles that's the very urban core where the majority of those 60,000 residents live. We have a very old housing stock, so we're dealing with a lot of antiquated infrastructure. And we're also dealing with a combined sewer system. But we also have an MS4 that's in the outskirts of the city that's – so we also have to meet the Chesapeake Bay requirements in cleaning up the nutrients that we're discharging from our MS4 community. We're also surrounded by some of the most productive non-irrigated farmland in the US, so when we look at the Chesapeake Bay and the TMDL on nutrient requirements, Lancaster County, as well as Lancaster City, has a big bull's eye when EPA looks at where a lot of the impacts are coming from because of our combined sewer system in the city and then the farmland and the nutrients that are generated from that farmland.

Slide: The Challenge

So let's talk a little bit about the challenge just so you understand the background. The city generates about 750 million gallons of polluted stormwater discharge every year. That's an average annual year. And just to put that into perspective, it's hard to wrap your head around 750 million gallons, but that's about 1100 Olympic-sized swimming pools that we generate from five overflow locations. Our original long-term control plan called for gray infrastructure. That gray infrastructure, if we – we completed a lot of projects in terms of upgrading our pump stations, but we had not embarked on any of our storage facilities that we would need to build to contain those overflows and then treat it when capacity is relieved at the treatment plant. That storage system would have cost about \$300 million in today's dollars, so we started looking at green infrastructure, knowing that EPA was beginning to embrace and allow that in a long-term control plans for CSO communities. So that green infrastructure plan showed that we could complete enough green infrastructure projects to have a cost of \$140 million, much more cost effective and about half the cost of a storage system. We also knew that doing nothing was not an option. We had received administrative orders shortly after the President's executive order on the Chesapeake Bay clean-up requirements came out, and we knew that we were facing penalties if we were not moving forward with those storage facilities, even though we had done a lot of work on our gray systems already.

Slide: Map of Lancaster City

So just to show you, the purple area on the outside is that MS4 area that I talked about, so we have both the challenges of the combined sewer area and the MS4 area around the city and the outskirts of the city to meet the nutrient load reductions that's required under the Chesapeake Bay. And this just shows that we're – even though we're very far away from the

Chesapeake Bay and our community doesn't – isn't directly impacted by the nutrient reductions and clean-up of the Bay, we knew that we had to meet this challenge and figure out a way to package and convince our residents of why this is important.

Slide: Impervious Area of the City

So our green infrastructure plan looked at our impervious area, and this pie chart shows that 41 percent of our impervious area is covered by buildings. An astounding amount of 32 percent of our impervious area is covered by parking lots. That was astounding to me, to know that we have that many parking lots across the city. And then 25 percent is covered by roadways. What's important about this pie chart is that if we're going to implement green infrastructure across the city to effectively manage and eliminate a lot of those overflows, the majority of the impervious area is in private hands. So we needed to figure out a way to incentivize private property owners to implement green infrastructure on their property, as well. We just didn't have enough public space to solve this problem alone.

Slide: Current Efforts Focus on Early Action and Continuous Improvement

As I said, we had done a lot of projects on our gray system by upgrading pump stations, spending a lot of money on screening. We did a BNR -- biological nutrient reduction project -- at our treatment plant, and we currently have another \$7 million in a new bond issue that's going out this year to do more upgrades at the treatment plant. So we're doing a lot on our gray system. We've done -- this is kind of our roadmap on how we feel that our program has been effective in securing funding for demonstration projects through a lot of grants. And we've been leading by example and integrating infrastructure into every capital project and demonstrating what private property owners can do on their property so that we can actually not tell them what to do, but actually show them that we're doing it where we can and how they can integrate it into their property as they're doing renovations or -- renovations on their property. And then we're developing a plan to scale this city-wide, and we're also reviewing all city ordinances to incorporate GI -- green infrastructure -- for redevelopment, as I said, trying to memorialize this and require it as redevelopment happens. We've also developed a stormwater website, and I'll show that a little bit later on. And we've conducted community education outreach through that stormwater website but also around all of those demonstration projects, really garnered a lot of public support for the green infrastructure projects -- not trying to bring people out and talk about stormwater, because they don't want to come out for a subject that's not sexy like stormwater. They want to come out and talk about a project that's happening in their own backyard and see how they're going to benefit from this program. And then we've looked ahead to develop incentives through our stormwater utility, and I'll talk about that a little bit later on.

Slide: The Green Infrastructure Benefit Calculator

So this is a very busy slide from our green infrastructure plan, but it's important because I'll talk about projects in each one of these impervious area types. We broke down each of the impervious areas by different types -- so you see roads and parks and sidewalks -- and then calculated how much impervious area is in each one of those impervious area types. And then we assigned what green technology can be used in each one of those impervious area types. And we tried to do demonstration projects in each one of those impervious area types so that we could demonstrate those green technologies. And we assigned a goal. We said, okay, if we

green 30 percent of our goal, how much annual runoff reduction will we achieve if we hit that goal of 30 percent of roads or 15 percent of flat roofs, using green roofs? And we also calculated the pollutant load reduction because we also have to meet the Chesapeake Bay TMDL. So the plan showed that if we managed 55 percent of our impervious area, we will be able to capture over a billion gallons of stormwater runoff over a 25-year plan.

Slide: The Approach

So as I said, we tried to do demonstration projects in each one of the impervious area categories, and green parks was one of the first ones that we embarked on. This just shows all of the green parks around the city.

Slide: 6th Ward Park

And the first one that we were working on was 6th Ward Park, and this was a project that we were already under construction while we were doing the green infrastructure plan. But we decided that this would be a great demonstration project because we were relocating a basketball court to a different area of the park, and so this was a perfect opportunity to take a lot of the stormwater runoff from the streets that surround the park and disconnect those catch basins from our system and pipe it into a deeper gravel bed underneath a porous basketball court. So this just shows the dedication that we had with some public officials, where they were throwing buckets of water on the porous court. But some of the other benefits that we're seeing from projects like this is that the neighbors have really embraced it because they – the basketball players can get right back on the court after a rainstorm because the rainwater soaks into the porous court very quickly and dries quickly. And the neighbors say that the basketball court is quieter because the porous court dampens the sound of the basketballs. So there are lots of benefits to green infrastructure, lots of side benefits in addition to stormwater management.

Slide: Brandon Park

Brandon Park was probably our most successful project. You can see the overhead view of the improvements that were made at that park. We achieved a four million gallon per year reduction in runoff or capture. And we're looking at each one of these projects from a business case, and we are looking at it in terms of the cost per gallon of stormwater managed. So since we managed four million gallons and we divide that into the amount of green infrastructure cost, we were able to see a \$15 per gallon – 15 cent per gallon green infrastructure cost. And we compare that to a storage system, a storage tank or tunnel, which could cost around 30 cents per gallon. So we're making sure that we're spending money that we do have wisely.

Slide: Wabank St. Curb Extensions

Just showing some of the individual BMPs that we constructed in this park. This is a very busy thoroughfare at the top of the park, where it had a lot of students that were walking to a nearby elementary school. The rec center, the city's rec center, recreation center, is in Brandon Park, so this is a very wide corridor, and we thought that we could achieve some traffic calming by doing some curb extensions with rain gardens. So you see the artist's rendition and then the actual constructed infiltration trenches there. You see some of the erosion.

Slide: Brandon Park

Brandon Park used to have a stream, if you look at the historical stream maps. So you see a lot of the erosion that was occurring through the park because the stormwater wanted to go where it historically went. We were able to add some riff raff and a rain garden down at the toe of that slope. You can see the porous paving along the parking stalls, with the traditional asphalt along the drive lane, and the porous basketball courts. So we implemented a lot of different BMPs within this one park. And you can see the basketball courts. We also made these porous and I see the improvements to the neighborhood and to the park.

Slide: Parking Lots

The city doesn't own a lot of parking lots, but we did have a couple of parking lots. You can see the number of parking lots all across the city. Most of those parking lots were constructed long before stormwater ordinances were in effect, so a lot of that stormwater flow was sheet flowing directly off into our combined system and some in the MS4 areas.

Slide: Mifflin Street Parking Lot

So we did have four parking lots that we were able to green, and I'll show you some before and after shots and just show you the improvement, huge improvement to actually some under-served areas of our city. This parking lot we were able to do at 10 cents per gallon and capture over a quarter million gallons per year in different infiltration trenches, some rain gardens, some porous paving, tree canopy.

Slide: Plum Street Parking Lot

This is Plum Street parking lot, the before and after, we have a lot of infiltration trenches along there. We actually improved traffic flow just with more organized parking in that area. This parking lot actually has a concrete – a porous concrete test strip, and a University of Maryland professor has some monitoring wells surrounding it. So over the years, he can continue to monitor the porosity and how much sediment builds up within that. And I can talk about maintenance of porous pavement a little bit later on, but in this parking lot we were able to achieve over half a million gallons per year of runoff reduction at a cost of 17 cents per gallon.

Slide: Total Numbers

So just an overall of those four parking lots, we were able to manage over one and a half million gallons per year in those parking lots at a cost of 14 cents per gallon. So pretty cost effective when we're comparing it to gray systems.

Slide: Green Roofs

Green roofs, the city does have over 100,000 square feet of green roofs, and actually the per capita of the number of green roofs is the highest in the country, one of the advantages of being a very small city. But we're continuing to build green roofs. This is the City Hall annex that we constructed on the back of our old City Hall, and on the top of that annex, we added a green roof. So we're incorporating green infrastructure into every capital project that we do.

Slide: Green Streets and Alleys

Green streets and alleys, we did a pavement management plan. Actually, we had a LIDAR study done of every street and alley so that we could fine-tune that 30 percent goal that we were trying to achieve and say, well, which streets are good candidates for greening? And we determined that the streets that are in very porous condition that need total reconstruction, that's the time to incorporate green infrastructure.

Slide: Green Street Graph

When you're totally rebuilding the street, you have a perfect opportunity to add porous paving along the parking stalls, rain gardens, infiltration trenches, tree canopy. The streets that are really going to get just an overlay, that are in marginal or fair condition, are probably not good candidates for green infrastructure. So we now have a ten-year and 20-year plan of which streets that we're going to actually have a green street focus when we're reconstructing them.

Slide: First Green Alley

So this was the first green alley that we constructed, and the – you can see the before and after picture. And again, some of the benefits, the side benefits of green infrastructure, while we were building this alley, there was a realtor that had a house for sale beside this alley. And he asked our construction crews what they were doing, and they told him that we were building a green alley. And he said, "Great. I'm going to go raise my asking price." And he actually went and looked online. He actually added to the multi-list that this was adjacent to the city's first green alley.

Slide: Alley 148

So you can see the before and after of this, where we were able to capture stormwater from the surrounding streets as well as coming off of the properties adjacent to it in a deeper gravel bed in the center of the concrete tire strips. And we were able to construct this at a cost of ten percent additional, with capturing 200,000 gallons per year of stormwater.

Slide: Using Traffic Safety and Transportation

This is probably one of our most successful projects and a really fun project. It was a very dangerous intersection right in front of Lancaster Brewing Company. And we were able – we wanted to remove the merge lane -- you can see it there, the large concrete merge lane -- and make it a standard four-way intersection. We had a lot of accidents with people who were not merging properly at the end of that merge lane. We were able to green this intersection, and we received a Red Light Enforcement grant from PENNDOT -- from our Pennsylvania Department of Transportation -- as well as a National Fish and Wildlife Foundation grant to add green infrastructure while we were doing this intersection improvement. We did a before and after speed study and were able to realize a five mile per hour reduction in average traffic speeds through this intersection, make it a lot of more safe for both motorists and pedestrians, shorten the crossing distance for the pedestrian.

Slide: Lancaster Brewing Public Private Partnership

And we were able to construct a porous patio outside of the restaurant that they were able to use for an outdoor patio. And they put a sign up in the restaurant in anticipation of the beer garden, what they dubbed the beer garden, coming after we constructed the project. And we were able to achieve 1.7 million gallons of stormwater reduction just within these different types of BMPs.

Slide: The Lancaster Brewing Company

You can see the patio that we constructed outside of the Brewing Company. The Brewing Company agreed to take over future maintenance of that porous patio as well as the raised planter bed that's in front of it, and they're able, actually, to do some urban gardening within that raised planter bed and grow some produce that they use within the restaurant during the summer. And during the summer, it's a huge economic benefit to them. They were actually able to double their revenue during the summer with the use of the outdoor patio. You can see the porous pavement in this photograph and the produce that they were growing in the raised planter bed. And another picture of the patio.

Slide: 700 Gall Cistern Functions as Public Art and Irrigates Planters

We also did a public art project in this location to try and do some community education with public art. This was the cistern that we had an artist -- a call for artists that an artist from Philadelphia actually designed this cistern that actually the restaurant can use for the rainwater from the roof of the restaurant to water the produce that they're growing, as well as a public art piece because it drips water from the cistern onto a little -- almost like a little drum that sits within the rain garden. We also did a placemat that the restaurant uses within the restaurant for children to learn about stormwater management and the public art project. So it was a fun way for us to get some public education into the restaurants.

Slide: Urban Tree Canopy

Urban tree canopy, we had a LIDAR study done. Department of Conservation and Natural Resources for the state did an urban tree canopy -- did a tree canopy analysis, a LIDAR study for the county. And for the city, they showed that we only have a 28 percent tree canopy. So to reduce that heat island effect, if we can get to a 45 percent tree canopy, we can really impact that as well as help pollution over that 25-year plan. I'm just showing some of the projects that we have where we're trying to increase tree canopy.

Slide: Mulberry Street Two-Way Conversion Project

This is -- Mulberry Street is currently a one-way street, a very long street that traverses the entire length of the city. We want to convert that back to two-way and make it more of -- rather than a thoroughfare. There's a lot of heavy residential properties along this street. We want to make it a two-way -- convert it to a two-way and make it more neighborhood friendly. And there's lots of opportunities to add trees where we have missing gaps of tree canopy, as well as rain gardens, some porous paving along one side of the parking range. So this project is currently in the final stages of design.

Slide: Innovative Financing Using SRF Funding (PENNVEST)

Innovative financing, we're trying to incentivize private property owners to retrofit their property. So we have \$7 million of a low-interest PENNVEST loan that we're using to incentivize private property owners to give them a grant towards construction. They're providing a 90 percent grant towards construction. This was a tobacco warehouse that was being renovated into condos, and they were going to build a traditional asphalt driveway or green alley next to the garages that serve those condos. We were able to offer them the 90 percent grant, and they were able to green that alley. And you can see the porous pavement is much more attractive for the residents that will be using it, rather than traditional asphalt, and manage a lot of stormwater. They were able to manage about a quarter million gallons of stormwater, not just from their two buildings, but also from the medical office building that you see to the right of this photograph.

Slide: Status

So our current status is that we have about 159 projects in various stages of either have been constructed or are going to construction this year or in conceptual design or in final design. And once we complete those 159 projects, we will have captured about 45 million gallons of stormwater. And as you can see at the bottom, we've spent currently, on the projects that we have constructed, about three and a half million dollars in grants, and we've matched that with about the same in local cities' funds.

Slide: Paying for It!

Slide: Impervious Area Fee Analysis

So we have to pay for this program, this 25-year program, but we also want to incentivize private property retrofits. And how are we going to do that? When we looked at the impervious area analysis, we saw that the majority of the single-family homes -- you see about 77 percent of our parcels are single-family residence, but they only comprise about 17 percent of the impervious area. So they're not the major contributor of stormwater. When we looked at the commercial and industrial, you see they're about 22 percent of the number of parcels, but they're about three quarters of the impervious area. So they're generating the most of stormwater into the system and in the MS4. So they, both in the MS4 community and the CSO community, they need to really carry their fair share of paying for this program.

Slide: Comparison of Charges

So how -- we did an evaluation of different methodologies of paying for stormwater programs. One example is the impervious area fee. One other methodology is a flat tax added on to the property tax. And another option is a sewer charge which is based on water consumption. But lots of communities around the country are adding that to a sewer charge, even though that is not the most equitable way to do it, just because that's an easy mechanism of doing it. So we compared the average residential versus the average industrial, and you can see on the average residential, on the left side of the screen, if we did it based on the property tax or their water consumption and add it to a sewer charge, they'd be bearing about two to two and a half times more of this program than what they would if we did it based on an impervious area fee or a stormwater management fee.

If you look at the average industrial property, if we do it based on their property tax or their assessed value or their water consumption, they're only paying a fraction of what they should towards the stormwater management program because those two methodologies are not – don't really have them bear their burden of the program.

Slide: Implementing a Rate Structure with Four “Tiers” Based on Impervious Cover

So we implemented the stormwater fee in February, and those fees are, as you can see, based on four tiers. Tiers one, two, and three pay a flat rate, and tier four pays based on their actual impervious area just because there's a huge spread. You can see in the red category, that's tier four. It's about 11 percent of the parcels in the city. There's a huge spread, from the lowest one being \$23 per quarter up to \$33,000 per quarter. So there's a huge spread, so we felt that they should be paying based on their actual impervious area.

Slide: Community Education and Outreach

We also have a stormwater website where all of our – we wanted to make sure that all of our information on the stormwater program is very accessible so that you don't have to try and find all that information buried within the city's website. And we've branded the campaign “Save it! Your water, your money, your city.” And you can go to saveitlancaster.org. That's the URL for that website. Lots of information about the stormwater utility is on there as well as projects that we're doing. We've also broken down what property owners can do on their property into three different categories – baby steps, big steps, and giant steps. If they want to be more intensive and do more on their property, they can look at some fact sheets in the giant steps and see how they can construct a rain garden or install a green roof. So that's where we've put a lot of that information so that – and all of our city cars have this logo, the Save it! logo on those cars, so we're really trying to brand and reinforce this campaign with everything that we're doing.

Slide: Lessons Learned or Keys to Success

So some of the lessons learned through what we've done over the last three years is to make sure that you garner that political and high-level leadership support early on in the process. You know, I've talked to a lot of people around the country who are trying to do this, some mid-level managers, and it's really hard for them to get something like this entrenched unless they garner that political support very early on. And it's a funny story about how some politicians, city council people, may shy away from an issue like this. But our mayor has fully embraced this and is really our biggest champion. He also has since become the chair of the local government advisory committee to the Chesapeake Bay, so he is really entrenched in this and is really our biggest champion. And during the last campaign, a previous mayor was running against him and brought up the green infrastructure program as a campaign issue and said this is a ridiculous way to spend money. It's throwing money down the drain. And the amount of support that was – that was put online in response to that article was just overwhelming. The young people wanted this program. They said it was the most cost effective rather than building storage tanks. They saw the benefit of the green infrastructure program, and it really turned the campaign around and really made it an asset for our mayor. And he was overwhelmingly reelected, so it was a really good testament to how a program like this really resonates, especially with young people who we want to move back into the cities.

And start your public education early and message it. Try and figure out something that resonates with the local community. And the way we did that was by doing those demonstration projects. Lead by example. Incorporate it into every capital project that you're doing, not just pass an ordinance that mandates or dictates that private property owners do this. And use stakeholder groups. We had a green infrastructure advisory committee that worked with us from the beginning of the green infrastructure plan through the utility development, and we had every different types of stakeholders from ever affected rate class in that advisory committee. And we made sure that we had geographical representation. Make sure you engage some of those hardest impacted rate payers, stakeholders, like churches. They often don't have a lot of revenue but often have a lot of impervious area.

And I said about the demonstration projects. Also, figure out your funding strategy. And integrated infrastructure is really key. We've really shown how we can drive that cost down of implementing green infrastructure if we're integrating it into other projects and not just building green infrastructure for the sake of building green infrastructure. And grants and grants and grants -- there's lots of grant opportunities out there. We've had many different types of state grants, many types of different federal types of grants. So there's lots of grants out there. And grow it even locally. We got our county transportation MPO, the Metropolitan Planning Organization that manages transportation funding, we got them to implement a Smart Growth transportation grant program, where they're -- they have projects from municipalities that can be -- that can request grant funding if they implement green infrastructure in their transportation project. So that grant funding has been made available locally which wasn't available before.

And one important thing that we've found is to include three years of maintenance in any contract that you do, especially with rain gardens or green roofs, that there's a high mortality rate, not just after the typical one year, but even after three, two or three years, those plant materials can die off in like the hard winter that we just had this past winter. And don't underestimate the value of public education.

Slide: Questions?

And that's all I have now. I can take questions.

Eva Birk

Great. Thanks, Charlotte. That was a wonderful presentation. We had a lot of great feedback and a lot of great questions coming in from the audience. We actually had two folks out of the probably 50 to 60 questions we have rolling in that said this is the best presentation on urban stormwater that they have seen ever -- exclamation point, exclamation point. So thank you again for joining us today, and we're happy to have you here and take advantage of your expertise and lessons learned. So with that, I will get to questions. We had a few questions about cities that are just looking at moving beyond demonstration projects, they're stuck in the demonstration project circle, if you will. And so those questions addressed, how do you match upcoming public works projects, like the basketball courts you mentioned, with green infrastructure opportunities? And how do you go beyond saying, okay, we've had one, two, or three intersections or basketball court constructions that have worked well. Now that's going to be business as usual. Now it's going to be the case every time we do an improvement like that through a public works mechanism. So if you have any advice for communities out there that are stuck in the demonstration project mode and want to move to the next step?

Charlotte Katzenmoyer

Yeah, I think it's just a matter of mapping out your – if you have a capital improvement plan, take a look at those capital improvement plans and figure out how you can incorporate green infrastructure into each one of those capital projects. One of the advantages we have here in Lancaster is all of those different departments are within my department. I don't have to work with another department to try and get green infrastructure incorporated into parks. So I do see that as you do have to have a lot of collaboration if you're not – if it's not all one department. But you can say, if you have stormwater funding, either from a utility impervious area fee or wastewater funding if you're doing it just through sewer fees, you can offer up that stormwater funding, the incremental cost of adding green infrastructure. Add that funding to another project to incorporate, integrate that green infrastructure into that project, into that capital project. So it's just, in my mind, just a matter of being very intent about trying to figure out how you can incorporate it into every capital project that's on that list. And make sure that if you have the opportunity -- like we're, during a lot of our paving projects, we're renewing the infrastructure, either water or sewer mains, and the gas company is doing a lot of rehab and renewal in their infrastructure. And so there's an opportunity to incorporate adding rain gardens as they're digging up that street. So it's just a matter of keeping an eye on what capital projects are coming down the pike and designing those – that green infrastructure into that capital project.

Slide: Poll

Eva Birk

Great. That's great advice, especially from the higher-level, organizational viewpoint. And you're right that it does take a lot of work to link across departments, and you seem to be in a good place where that's somewhat easy to do and that you built a culture of doing that. So that's wonderful advice. We had about ten to 15 questions come in about permeable pavement, lessons learned specifically with permeable pavement in terms of maintenance and lifespan.

Charlotte Katzenmoyer

Yeah, so let me show a picture of – I think you can still see. Can you still see my video?

Eva Birk

We might not be able to see it right now. We just launched a quick poll to see how many folks are viewing the screen. But after that poll is closed in about 30 seconds or so, we can bring it up.

Charlotte Katzenmoyer

Okay. So I just added some slides at the end of my presentation on a vacuum sweeper that we purchased. We have street sweeping. Actually, we moved that street sweeping budget from our general fund over into our stormwater fund, which really helped the general fund and property taxes, because the street sweeping is a permit requirement for our combined system. So that's a legitimate stormwater management practice that can be funded through a stormwater utility. So about every five years, we replace a street sweeper. So in 2012, the street sweeper that we replaced, which was just a mechanical sweeper, we replaced it with a vacuum, a regenerative vacuum sweeper. And that vacuum sweeper is helping us with maintenance of the porous pavement. So that vacuum sweeper now routinely will go into the areas where we've installed

porous paving. But that vacuum sweeper also has lots of attachments. It can act almost like a Vector truck, with the attachments to clean out the catch basins.

A lot of these water quality inlets that we're constructing at the end of green alleys or in intersections or in the rain gardens, the water quality inlets have to be maintained, as well. So that vacuum sweeper has attachments that can actually clean out those inlets, and those inlets also have some inlet bags, water quality bags or socks that are in there that have to be taken out and cleaned because they absorb all of the road salts and motor oil and things like that that come off the streets. So those inlet bags also have to be cleaned out. But I have some pictures, after that poll closes, that you can see, some of the pictures of the vacuum sweeper.

Slide: Maintaining Pervious Pavement and Rain Gardens

Eva Birk

Yeah, we can see it now. Great. So who knew that a vacuum sweeper could be that handy?

Charlotte Katzenmoyer

Yeah, and the next one shows the actual attachments onto that vacuum sweeper and maintaining some of the inlets within the rain gardens.

Eva Birk

Excellent. Well, thank you so much, Charlotte. And unfortunately, because of time, we're going to have to move on to Matt's presentation expediently here. And while I'm introducing Matt, I'll go ahead and allow him to share his screen. But what I will do is I'll keep some of the questions that didn't get answered for Charlotte and ask them at the very end of the webcast to both Matt and Charlotte. So thanks again, Charlotte.

Charlotte Katzenmoyer

Thank you.

Slide: Every Drop Counts. We can all make a difference.

Eva Birk

So at this point, I'd like to introduce our next speaker, Matt Millea. Matt was appointed Deputy County Executive for Physical Services by Onondaga County Executive Joanie Mahoney in June 2010. And as deputy executive, Mr. Millea oversees the operations of nine county departments and assists the county executive with the development and implementation of the annual county budget – not a small task. Matt has been charged by the county executive to manage the county's Save the Rain effort, which is a multi-million dollar public works program using both gray and green infrastructure approaches to mitigate sewer overflows into Onondaga Lake. And I also wanted to make sure that we mentioned that Onondaga County is one of our initial green infrastructure partner communities, here at EPA's Green Infrastructure Program, that we identified in 2011.

So we've had the privilege of working directly with Matt and the folks at Onondaga County for some time now. They've been a great partner, and just last fall they actually co-hosted EPA's National Green Infrastructure Community Summit up in Syracuse, New York. So to put it mildly, they are building a strong reputation up there for regional leadership on green infrastructure issues, and we're very happy to continue working with them. So we're lucky to

have Matt here today to speak on the culture change that has taken place within his region. I know that it is well known and that he has spoken many times before about how that culture change took place. So looking forward to hearing your story, Matt. Can you hear us okay?

Matthew Millea

Yes, I can hear you great. Thank you for the introduction, and I appreciate Charlotte's remarks very much. You'll see a lot of parallels in how we're running our programs. And I do have some envy from what I just saw because we're a county working in a city, and I'll get into some of the complexities of that. But I'm particularly envious of stormwater fees and being able to work on the street sweeping because that's something we do not control. But I will get into our story, again, very similar.

Slide: iPhone

And I start with this slide, and I use this to kind of give us some context to what we're really dealing with here as far as green infrastructure goes. And I see some parallels with iPhones. And I saw this in a magazine recently, and it really struck me as very similar to what we're dealing with in the green infrastructure world is that it's amazing when you think about the iPhone, that seven years ago it didn't exist and nobody even knew they needed one. And I read a book recently about this called Dog Fight. It was about Android and Apple fighting for cell phone space and the discussions that Steve Jobs had with his team when he said, "I want to build a phone with no buttons." And everybody thought he was crazy, and nobody thought this was going to work. And just seven years ago, he fought to make something that nobody had thought of before into reality. And now you really can't live without it. All of us probably have a smartphone, Samsung or Apple or whatnot.

Slide: Syracuse, New York and Onondaga Lake

And I really think that green infrastructure is kind of on a similar trajectory as far as the notion of saving stormwater is not new, but the notion of using green infrastructure as a regulatory tool, as a compliance tool, is really about seven years young. And we've come a tremendous way, a long way in the past seven years. Similar to the iPhone, it's taken off like a rocket. And because of the support that we have from EPA, hopefully our regional directors, and also our states, green infrastructure is really starting to become this really fantastic opportunity, as you just saw with Lancaster, to really improve our urban landscapes while at the same time accomplishing our clean water objectives.

So this is a shot of the city of Syracuse. If you've never been here, you're looking at downtown Syracuse. And up on the top of the screen, there's Onondaga Lake, which at one time was one of the most polluted water bodies in the nation. On the left side of the shore is infill that came from a waste process from Solvay Waste, which became Allied Chemical, which was purchased by Honeywell Corporation. And that is the lake that we're attempting to continue to clean up through our CSO reduction program.

Slide: Star Wars Picture

You also may know that Syracuse gets a little bit of snow, and just a few weeks ago, I was driving to work, and this is what I saw. This is my slide for the May the 4th Star Wars celebration. My kids get a kick out of that one.

Slide: A Better Way Forward

But why are we saving the rain here in Syracuse? I showed you the picture of the lake, and then it ties in with my boss, County Executive Joanie Mahoney. And the headline here kind of says it all as far as needing to find a better way forward. And what Joanie Mahoney argued for when she ran for office in 2007 -- and this ties in again with the newness of green infrastructure as a strategy -- in 2007, she ran for county executive on a platform of needing to find a better way to address CSOs in our communities than simply by building sewage treatment plants in communities that didn't want them or in commercial areas of our city that were kind of just beginning to grow and come back from years of neglect. And her campaign was really focused on finding that better way forward and really saying to the community that there needs to be a better approach that takes into account all of the interests of our community and not simply the best engineering solution.

Slide: Sewage Treatment Plant

The solution that was presented in 2007 was about building regional treatment facilities. And these cost between \$70 million and \$120 million each to build. And what we have here is a small storage system that includes some Vortex swirl concentrators, and you can see -- if you can see on just the little side of that picture, it discharges directly into Onondaga Creek, which flows into Onondaga Lake. And again, her point was there has to be a better way than to build these sewage treatment facilities in communities that don't want them.

Slide: Gray – Green Strategy

And then the gray/green strategy presented itself to us through communications with not-for-profits like NRDC and through environmental groups and through community dialogues. And what we've really been endeavoring to do since she took office in 2008 is find that balanced approach to using gray and green infrastructure. I think it's very important to stress that, as Charlotte did, is that we're not out here saying that green infrastructure is going to solve all of our problems. Gray infrastructure will still most likely be a very integral and important part of whatever program you're managing.

Slide: Wastewater Treatment Facility

I'm going to skip back to this one. So our wastewater treatment facility was upgraded in 2003 through 2007, with a \$173 million investment for ammonia and phosphorus removal. And those were the two major contributors to hypoxia in the lake and algal blooms and really needed to be under control. And because of this investment and this really significant technology that we put into the treatment plant, we were able to go to the federal courts in 2009 and argue that we had made the proper investments in our wastewater treatment system, and now we no longer need to build these smaller sewage treatment plants to get to the water quality objectives that we strive for, and that instead we could use a balanced approach of storage and green infrastructure to accomplish the same objective that we agreed to in the early 2000s under a federal court order.

Slide: Gray Projects

We're going to spend an additional \$150 million on gray infrastructure through the Save the Rain program, and we're well into that now, in 2014, where we've invested in interceptor sewer

replacements, we've invested in conveyances, we've invested in two large storage facilities which I'll show you some pictures of. Sewer separation, when appropriate, is a very cost effective strategy for us. And then also, floatable controls and CSO facilities planning.

Slide: Picture of Conveyance to Wastewater Facility

I'm just waiting for the pictures to load here and make sure you can all keep up with the slides. The picture that's coming into your screen right now is a shot of the conveyance that goes to that wastewater treatment facility that I showed you earlier. And I show this picture to kind of give a sense of how disruptive those wastewater treatment facilities really were. These were not remote, by any means. These were right smack-dab in the neighborhoods. This is in the south part of the city of Syracuse. And oftentimes, because of bed rock being very close to the surface, they had to use dynamite in order to get this 70-inch diameter pipeline through the neighborhood. We ended up extending it to just one additional outfall, and we avoided extending it another 5,000 feet through the use of our green infrastructure.

Slide: Lower Harbor Brook CSO Storage Facility

What that facility goes to – where am I going? What that – what that – sorry. Technical difficulties. What that flows to is this sub-surface storage system. The storage system is a four and a half million gallon sub-surface system that's an alternative to that wastewater treatment facility. This is a Venn drawing that we have, and I'll show you a quick video of what it looks like. See if that loads up for you. So what you see here in this video is – I'm not sure if it's working – is that rather than doing an above-ground storage system, we opted to do sub-surface storage. This is four and a half million gallons, and this will fill up during wet weather events and will maintain the storage on site and wait till the capacity is at our treatment facility and release it back into the system and treat it at our wastewater treatment facility.

Slide: Picture of Project

Next, here are some construction pictures. So again, this is about a \$25 million construction project. It took 18 months to build, and we were able to achieve compliance with our regulatory deadlines on a very expedited construction schedule. The construction team just did a great job with it, and we incorporated a lot of green technologies into it. We save the stormwater on site, and we use it to flush the system after rain events, again, incorporating green infrastructure strategies into our gray projects.

Slide: Clinton Sewershed

I'm just waiting for the system to catch up. Our next project was a large storage system right in downtown Syracuse. This, again, is an alternative to the regional treatment facility that was proposed in the early 2000s. Rather than building a wastewater treatment facility – I'll show you the picture here.

Slide: Pictures of Armory Square Project

Just to the right of this picture is our Museum of Science and Technology in an area called Armory Square. So imagine your community had invested all of this time and resources to build a new entertainment center and downtown residential district, and then you built a wastewater treatment plant right next to it. What we have here is an alternative to that, where

we have our six million gallons of storage, and we've avoided building that sewage treatment facility and instead have this really remarkable facility that the team just did a great job constructing under very tight timeframes and was online December 31st, 2013, in order to achieve compliance with our court order. And this is a picture of our tunnel, and the interior now is about a 90-inch inflows and the three tunnels that were constructed out of concrete through cut and cover fill up in, I believe, in about 15 minutes during wet weather events.

Slide: Green

So now we'll get into the green stuff. Now, similar to what we heard in the previous presentation, I think "To work in sustainability is to work in complexity" is a great quote. And I think the same is also very true for green infrastructure. Working in green infrastructure requires a lot of complex solutions, a lot of cross-pollination among many departments, and a lot of departments that weren't necessarily concerned with stormwater before now have to be very critical partners to getting things done.

Slide: Rooftops to Rivers

And our journey began, as I mentioned, with Joanie running for office and Nancy Stoner, at the time working for NRDC, giving her this book, *From Rooftops to Rivers*, and saying, "Here, give this a shot. Try some of these ideas, and I bet you that Syracuse can be a leader in this."

Slide: A Plan Developed

And from that book, Joanie came in to office and started to work with CH2M Hill, who was our firm that was hired in 2008 and I believe is also assisting with the program in Lancaster, to put together a strategy.

Slide: Green Infrastructure Program Summary

And very similar to what we saw in Charlotte's presentation, the plan really comes together on one sheet of paper, and you go from there. You have to look at your opportunities on streets, open spaces, public facilities, how much might you get through voluntarily, green infrastructure deployment, how much are you going to get through public-private partnerships, and your ordinance. They're all critical components of achieving your long-term objectives.

Slide: A Plan Evolves

Just waiting for the system to catch up.

Slide: Green Infrastructure Plan

Our plan evolved over 2008 and 2009. In 2009, the federal courts authorized an amendment to our longstanding court order, which I think is an important statement because more often than not now we're seeing communities revisit older agreements and reopen them for discussions about potentially shifting some of their gray costs into green infrastructure, and we were very pleased in 2009 that we had the support of our attorney general, or DEC, as well as the litigants who sued Onondaga County in the 1980s to clean up Onondaga lake. We all came together and agreed to go back to the federal court and argue for a new plan that balanced these gray and green elements.

Slide: Stormwater Management Model

This plan was developed, as you see, by November of 2010, and then over the past two years, we've been developing a much more sophisticated stormwater model. And I think, as you heard from Charlotte, it's very important to be able to model and optimize your system and your planning for the execution of green projects. You need to know where they're going to be the most effective, where you're going to get the most bang for your buck. You need to understand your sewer system. But in addition to simply understanding your sewer system, you have to understand the hydrology of the area that you're working in. Now we have added to our stormwater model some pretty granular analysis of hydrologic sub-catchment areas that go along with our nodes of the sewer system.

Slide: Soil Standard Overlays

And in addition to that, we've added soil standard overlays so we know where the soils are most optimal for green infrastructure deployment versus areas where it's not likely going to be as efficient or effective.

Slide: Impervious Cover Overlays

And then, as we saw with Lancaster, as well, we have an analysis of impervious cover. And I think, when you layer all of those elements together, you put yourself in a very good position to start making some strong decisions about where green infrastructure will be most effective and where you're going to get the most bang for your buck. We did not have this analysis when we started our program, and I wouldn't recommend delaying your effort to get some green infrastructure in the ground if you're thinking about going in this direction. I think you can work on parallel paths. Green infrastructure can go in the ground in your community without having this level of sophistication. But as your program evolves, and as you start to build more and more green infrastructure, it's very helpful to have a tool like this to make those back-end decisions as you start to get to wherever you need to be on the compliance spectrum.

Slide: CSOshed Priority Map

And this is where we end up with a CSO shared priority map, where the red areas are those areas where we're not necessarily going to see great return on investment for green infrastructure, and the green areas are areas where we should really dedicate the remaining dollars that we have within our program to optimize green infrastructure and target those specific CSOs for reduced volume into them.

Slide: We Started by Asking, "What if..."

So prior to having the big model, we had our good plan, we had a lot of GIS information which was put together by your consultants through 2008 and 2009, and we started by asking a simple question of what if we simply added green infrastructure elements to public buildings that we owned in the city of Syracuse?

Slide: County Facilities

And this slide is taken directly from the PowerPoint that was used in our federal arguments when we appeared before Federal Justice Scullin and we said, "What if we looked at this area

of the city of Syracuse and just added significant green infrastructure to this corridor? We could accomplish ten million gallons in CSO reduction by simply looking at publicly owned infrastructure and getting under control some of the stormwater in this targeted area.”

Slide: Green Roof on Civic Center

And we think that this slide was very compelling to the judge, and we executed very quickly a strategy to get to get moving with a green roof on the Onondaga County Civic Center. And we were able to put a 66,000-square-foot green roof on this facility, and it was a cost of about a million dollars, and we get about 750,000 gallons in CSO reduction from this. And the nice part is I can look out my window and see it every day. And now that the sun is out in Syracuse, it's starting to green up. And we also are working on a research project with scholars from Syracuse University to determine how closely our modeling is to reality with regard to the capture and then also the heating and cooling benefits that the green roof provides.

Slide: Hockey Rink

We added a stormwater cistern to our historic War Memorial Hockey Rink and, similar to what Charlotte was talking about as far as getting the community invested and having some demonstration projects which they can touch and feel and take some ownership of, we thought that doing something at the hockey rink where our professional hockey team plays would give us an opportunity to have a continuous conversation with the community. So it's not necessarily a tremendously effective stormwater project, and particularly not on a cost-per-gallon basis, but we think we get a tremendous amount of mileage out of the fact that we can talk to our entire community about how our hockey team is playing on recycled rainwater and really advertise the Save the Rain program to all the people that visit us for the various events at that facility.

Slide: Old Parking Lot

As we saw in the previous presentation, green infrastructure also provides just a tremendous opportunity to take areas that need a little bit of a spruce-up and add in your stormwater capture while also providing some tremendous aesthetic benefit. What we have here is a parking lot that's right next to our museum and a plaza that leads into the convention center as well as that arena that I just showed. And this is how we used to invite people to our civic center and say, yeah, come see your child graduate, come see a hockey game, and you'll have to park in this mud pit.

Slide: New Parking Lot

Instead, we were able to invest some of our green infrastructure resources into repaving this facility, putting in bioswales through the center of the parking lot. It's all conventional asphalt – I'm just waiting for the slide to come up here for you – conventional asphalt with bioswales through the center and getting tremendous capture from the parking facility as well as from the sloping green area to the right and to the bottom of the page.

Slide: Finished Project (Parking Lot)

And then, at the end of the day, you can just see the tremendous aesthetic benefit that comes from targeted green infrastructure investments where you're going to get your stormwater

benefits but also make tremendous improvements to areas that are trafficked highly by the residents of your community or opportunities to showcase the program that you're working on.

Slide: On-Center Surface Lot

You don't always need to use the same approach. Different parking lots bring different challenges. So just to the east of the parking lot I showed you was another opportunity to target a large parking area that we owned in the county that serves the convention center. And in this one, you'll see in the photo here that rather than going through the center and using bioswales, we went around the perimeter and we used porous asphalt around the perimeter of the parking area as an alternative to the swales.

Slide: Parking Lot under Construction

So now we'll get a tremendous amount of stormwater capture from the runoff from the entirety of the parking lot, but the center of it is still conventional asphalt while the perimeter is entirely porous, similar to the park area that I think we saw in Lancaster in one of those slides.

Slide: Project Metrics Summary

Again, not technologically complicated, not terribly expensive, but certainly an opportunity to get a tremendous amount of stormwater capture from a parking facility that's not going anywhere, that provides great benefits to the community, but at the same time we were able to improve it. So we get 1.6 million gallons in CSO reductions from a \$500,000 investment. And you'll see on my note here the little arrow that says, "Embrace the change order." This is something we talk about with respect to working on smaller green infrastructure projects, particularly if you're using your traditional sewer engineers and your wastewater staff to manage these. They're really used to managing big projects, by and large, and they're probably very conservative, as they should be, and they're probably very risk adverse, as they should be.

What we talk about with green infrastructure, though, is that you have to accept a little bit more risk, and you have to take into account the scale of the project that you're working on. And it's not really worth spending tens of thousands of dollars of staff time to avoid change orders on every small project that you're doing, particularly if you're going to be doing a hundred green infrastructure projects. You have to accept a little bit higher risk, and you have to embrace the change order. And when unforeseen circumstances come up, you kind of got to roll with them, adapt as these things come up, and keep moving forward. It doesn't mean that green infrastructure is a failure. It simply means that you're addressing challenges in the field as they come up.

Slide: Final Project Picture

And this is a picture of the final project. Wait for that to come up on your screen. There's the finished product. We also added LED lights and electric car charging stations which, again, as you're moving forward with your green strategy, you're very likely to be moving forward on many fronts in the sustainability framework. And when you have an opportunity to add additional elements, whether they're solar panels or car charging stations or LED lights, they're certainly opportunities you should take when you have them.

Slide: Pictures of Roads

With regard to roads, and this kind of fits in with the overall theme of fitting into public works projects, I think there's certainly opportunities when roads are being done. We saw in the previous one a great opportunity with curb bump-outs, and we're seeing those in many communities that are aggressively adapting these green infrastructure strategies, whether you're inside the sidewalk space or you're in the right-of-way. There's lots of different approaches here. And this is very similar to the one we saw in Lancaster, where you're simply bumping out three feet into the roadway, and you have your curb cuts, and you build your swale. And I'm very impressed with the execution on this one because the staff just did a great job of giving us an idea of where we were headed, and they delivered very well on the promises that we made to the City of Syracuse when we asked them for three feet of their right-of-way. This is now in its second year, and it's held up extremely well to pretty tough winters and lots of salt intrusion -- these are salt resistant species -- and just a great example of a targeted approach that can be repeated over and over again in a community that's not really tremendously maintenance intensive but does a great job of capturing stormwater and telling your story.

Slide: From This...

So we went from having an idea and having a targeted area -- and again, this is my point on the model is you don't necessarily need a terribly sophisticated stormwater model to get started. You pick an area. You focus on it. You start executing some projects there, and you can go from a PowerPoint slide like this to having a concentration of green infrastructure in an area that really helps you begin to sell your program locally.

Slide: Picture of Green Infrastructure Area

This is where all of our elected officials come to meet as the legislature or to come for a lot of events at our convention center, and has given us an opportunity to really showcase a lot of different green infrastructure approaches in a very tight area.

Slide: Green Streets

Green streets, again, I think fit very well into the theme of this presentation as far as fitting into public works projects. What you saw before was simply bumping out the street, and what I'm going to show you now is more of a comprehensive approach to redoing an entire street block from end to end, where we had -- if you look at the red roof on your left, that's the Syracuse City Hall. And on the right is a historic building. And on the other side of this building, the Erie Canal used to flow right through the city of Syracuse. So we had an opportunity here to take an idea that someone had sent to us to really turn this into a showcase green street.

Slide: Rendering of Green Street Opportunity

And we were pleased to get this recommendation from somebody outside of county government, but what they suggested to us was, as you move forward with this, here's an opportunity to really make a big investment in an important area in your community. And we embraced, it and in 2010, we started construction on one side of the street.

Slide: New Sidewalk

And you'll see that we redid the entire sidewalk, and you'll see the darker areas are the plantings for the trees. And just to the left of those are the parking areas where we put in the porous pavers.

Slide: Erie Canal Museum

We put a green roof on top of this building. The building that will be popping up soon is the Erie Canal Museum and, again, gave us an opportunity to put a green roof on a historic structure and also hopefully provide them with some heating and cooling benefits during the various seasons.

Slide: Porous Pavers and Tree Pits

But here's a shot coming up of the street scape itself, with the porous pavers, the tree pits. And you can see the real connection of the stormwater systems to the street scape. Very comprehensive in its approach, lots of capture. I think, for this block, in and of itself, we'll get 90 percent stormwater capture during your typical design storm, one-inch, two-hour storm. We'll maintain all of that water on site and keep it – the tree pits are connected to the sub-surface parking areas, so there's just a tremendous amount of storage under those.

Slide: Street Vegetation

Growing in very nicely, lots of vegetation. And lots of maintenance but something that we're making a priority. And I'll talk about that a little later on in the presentation.

Slide: Rendering of Green Street

Just waiting for the next slide to come up. As we work with the City on these – and this is unique and a little different than Charlotte's presentation because we are Onondaga County working in the City of Syracuse. And we've had tremendous partnerships with the mayor, her team, the city council in making projects like this work because they need to give us permission to do these projects in their right-of-way, on their sidewalks. We've worked on some very unique legislative strategies to get annual permission ordinances passed, where the county can go in and let contracts for these work – these public works projects, do them in their right-of-way, and then transfer them back to the City when the project is done. We do the construction management and oversight of the entire project, and we work with the city engineer to make sure that we're following all of the right protocols. But they're still county projects in the city right-of-way. What you see here is an example of working with them on getting these bike lanes put in, as well. So although we're doing the green infrastructure projects to hit our green infrastructure goals and our stormwater goals, it's an opportunity to add these other elements like bike lanes.

Slide: Green Street Finished

Here's just another shot in comparison to where we started. I'm just waiting for that to load up for you. So there's our view, our after view, again, just a really tremendous project that we're very proud of and a very comprehensive approach to green street versus the simple bump-out that we showed earlier.

Slide: Green Infrastructure Project Status

In 2011, as we started moving forward with a lot of these projects, the county executive and I were talking about how are we going to advance enough green infrastructure projects to achieve our court ordered objectives of 2018? This gets back to the work order discussion. It gets back to the challenges of doing something new and innovative that the staff isn't necessarily that up to speed with or on board with, as far as culture change goes. So one of the tactics that we used to get some hefty buy-in from the entire team was we challenged them to get 50 projects done in 2011. And we did this with the knowledge that a lot of work had been done in advance as far as targeting areas and finding opportunities for green infrastructure. We had also launched a public-private program which I'll talk about a little bit more, and we were pretty confident going in that if our team really focused on the objective, got out of the weeds a little bit, and worked together that they'd be able to achieve it. And we were extremely pleased with the results because they were able to really put their heads down, working with our public works agencies through water and sewer, with the city engineer, city DPW, our outside consultants from CH2M Hill all put their heads down and worked very hard in 2011 to get 62 projects in the ground. And then in 2012, they got close to another 60 projects in the ground. So we have an incredible high density of these projects, and they are at all different scales, at all different costs. And they just did a great job of focusing on the macro objective rather than fighting about micro problems, and it really helped them to embrace the overall objective rather than fighting about project by project.

Slide: Green Infrastructure 2011 Signature Projects

One of the third marquis projects – we had three marquis projects that we had earmarked in 2010, the green roof on the convention center, the water reuse system at the hockey arena, and our treatment wetland and restoration project. This was a project that had really been in the design phase for close to 20 years with professors from the SUNY College of Environmental Science and Forestry, which is here at Syracuse, and they had often suggested that we should restore some wetlands along a tributary to Onondaga Lake that had been filled in many years ago as part of a misinformed mosquito control program, I think. So one of our objectives was to take direct CSO outfall and flow it through a three-cell constructed wetland.

Slide: Process Flow Diagram

And what we found with this – and I'm putting up now – should pop up soon -- what we found with this is, as you look up to the upper left of this page, you'll see that we're diverting the flow from the existing trunk sewer through two sand sep-grip and floatable control chambers. And then, as you follow that bottom yellow line, it flows into the various cells of the wetland. And then we can flow out of the wetland back into the discharge point, where we'll flow into the receiving water. Interestingly enough, as you deal with most green infrastructure projects, you're dealing with nonpoint source projects, best management practices, and a certain set of people within the regulatory world that are used to dealing with those things.

When you do a project like this, however, this is a point source project because we're talking it out of the sewer system and treating it after it leaves the sewer system. So the best laid plans, as they say, we've run into a tremendous amount of regulatory hurdles on this front because, although we think we're improving water quality dramatically versus the typical CSO overflow, we are being treated as though this was a treatment system rather than a nonpoint source system. So these are just some of the growing pains, I think, of dealing with a new approach to

the regulatory environment and something that we're working very closely with our state regulators on to show that the environmental benefits from the three cells of the wetland by far outweigh the current situation of simply discharging the CSO into the Harbor Brook that you see up on the left here.

Slide: Picture of Treatment Wetland

It should pop up momentarily. So on the top of the three treatment wetlands is the brook, which flows right into Onondaga Lake. So one of the challenges you may face, should you wish to build a treatment wetland. Fair warning has been given.

Slide: Pictures of Buildings

Public-private partnerships are incredibly important. As Charlotte mentioned, a lot of the property in all of our communities will be privately owned, and we will need private participation in order to accomplish the volume reduction that we're looking for. That means putting green roofs on private buildings. That means helping to pay for parking facilities at private buildings like the one that's popping up now. This is a LEED Platinum hotel that's up near Syracuse University that we helped to pay for the parking area here, which was done with porous pavers. And we now have about \$5 million invested through our green improvement fund where we've invested those funds through private property, implementation of green infrastructure, and with those grant awards comes a ten-year maintenance agreement with the private party.

Slide: Rain Barrel Program

Like many communities, we're also doing a rain barrel program. We could do better. I think, if you're looking for some great examples of rain barrel programs, Milwaukee is certainly a great one, where I think they have close to 6,000 rain barrels that they've put out already. We're a little closer to 600, but at the end of the day, if you're able to get a lot of rain barrels into the right targeted neighborhoods, and people are emptying them when the weather is good, and they're filling up when the weather is bad, there is some definite measurable benefit to having them participate. Moreover, though, the rain barrels get people invested at the household level. Similar to recycling in the blue bins and putting the right things in the right bin, giving someone a rain barrel gives them an opportunity to buy into the program and be a part of it, even if it's just 30 to 50 gallons at a time.

Slide: Strategic Partnerships

One of our major strategic partnerships is Syracuse University, and this also fits in to the theme of this workshop, which is working on public works projects. Nancy Cantor was, just until January, the chancellor of Syracuse University, and she really wanted to connect Syracuse University to downtown Syracuse, that area I showed you earlier where the storage system was built.

Slide: The Connective Corridor

And what we see here is the map of the roadway that was going to be worked on in the connective corridor, it's called. And what we did is we went, and we talked with the chancellor, and we talked with the mayor, and we said, "Why don't we add green infrastructure to your

connective corridor project? You're going to be doing a major multi-million dollar public works project, and we will invest our sewer resources to add green infrastructure elements to it." And both the mayor and the chancellor agreed in 2009 to stop what they were doing as far as going to bid and help redesign some of their project, working with our consulting firm.

Slide: Pictures of Bike Lane

And what we have here now is the bike lane. And I love this picture because this could be – this could be Portland, this could be Seattle, this could be Lancaster. We're very proud that it's Syracuse, New York. And you see on the left is the swale area where we get stormwater retention there. And when the next picture pops up, you'll see the bike lane has porous pavers on both sides of it which feed into the storage underneath the bike lane. The bike lane itself is not porous. That's a federally required green paint that was part of the conditions of getting a federal grant for some of the highway work. And again, that's one of the challenges of working on existing public works projects. There's lots of different rules that apply depending on where the funds come from. So in this case, we're adding county sewer dollars to a university-led project that's funded by and large by federal highway grants, so lots of complexity in managing those waters.

Slide: Pictures of Swales

But as you can see in the next slide, in addition to the bike lane and the porous pavers, we took the opportunity to add some pretty significant swales to Genesee Street, which is one of the main corridors from the east into the city of Syracuse. And in this case, we've just – we've seen tremendous return on this investment as far as wow appeal, getting people asking about the program, and really showing off the difference of the green infrastructure approach versus that of the conventional. And in this case, you can see that the water will slide – the stormwater slides down the hill and comes into that vent right in the city, the center of the screen, into that inlet. And at the bottom of the thing, you can see – the bottom of the swale, you can see the overflow that we put in for those heavy rain events. But at the end of the day, this handles a tremendous amount of volume for us.

Eva Birk

While we're looking to wrap up here in just a few minutes, you can show us a few more examples, and then we'll have to head into questions. But this has been –

Slide: Green Basketball Courts

Matthew Millea

Yeah, you got it. So let me just skip right to, very quickly, some green parks, very similar. We did the porous basketball courts, very similar to Lancaster. And I think that the jury is in on that one, that green basketball courts are better and quieter. We had the same feedback here in Syracuse and also very positive feedback from the neighborhood, that after a rain event, the kids can get out there and enjoy the basketball courts almost as soon as the rain stops.

Slide: Zoos

We'd also encourage you, if you have a zoo, zoos are great, great opportunities to present green infrastructure solutions. You've got an audience that's coming to learn and coming to

embrace all that zoos deliver as far as nature and the environment, and we've invested a lot of resources in our zoo as far as getting green infrastructure into the parking area, getting green infrastructure elements into major capital improvements we've made in the entryway, and then also we've added significant green infrastructure elements to the interior of the zoo, where we now have a constructed wetland system that recycles the stormwater that we capture on site and no longer use potable water for the waterfowl pond. So lots and lots of opportunities for green infrastructure, regardless of which area you might be in, whether it's parks or roads.

Slide: Road Reconstruction

And just finally, I will end on road recon. Road recon is a program that the City of Syracuse runs, the road reconstruction program, where every year they've got a certain amount of capital allocated towards typical mill and pave road reconstruction. And we've managed to partner with them to add green infrastructure elements at very low cost to their road reconstruction. And this is an instance where they'll move forward with the work at the city level. They will let the contracts, or they will manage it internally through their own staff, and we will simply give them the cash resources to add the underground infiltration that's designed by our firm. So as you can see on this fact sheet, we'll invest \$188,000 to capture 1.4 million gallons of stormwater through a very simple road reconstruction project that's laid out here on the GIS map on this fact sheet. And similar to what Charlotte was talking about, a project like this will cost 12.8 cents per gallon, very cost effective, a lot of stormwater capture, and a great opportunity to integrate green infrastructure into a conventional street project. So if we are low on time, I'll cut it short there. Sorry it took a while to load some of the slides, but I very much appreciate the opportunity to tell you what we're up to here in Syracuse.

Eva Birk

Great. Well, thanks, Matt. That was a wonderful presentation, and thanks for speaking with us today. There is a lot going on in Onondaga County. What I can do is, I have one specific question for Matt that a few folks are interested in, and then I can open it up to questions for both Matt and Charlotte. And it looks like we're just coming up at the end of our time here now, but if you guys are okay with going five minutes over, I don't think our webcast software will crash and burn if we just go over five minutes. So if you're okay with that, I'll hand one question over to Matt, and then we'll open it up to both speakers.

Slide: Speaker Contacts

Matthew Millea

Sounds good.

Eva Birk

Great. So the question for you, Matt, is a lot of folks were interested in the right-of-way improvements, where you transferred responsibility to the County for a temporary period of time and then transferred that back to the municipality. So how exactly do those agreements work out, and who takes care of maintenance?

Matthew Millea

Every year over the past three years, we have gone to the city council with a list of targeted projects, and it's usually between ten and 20 projects that we think we would move forward with and we get the city council's approval to go forth with those projects. And then, at the end

of the year, that list extinguishes. So every year, we have to go and revisit the issue and extend the authority that we have to let contracts for those projects. After the city council gives us the authority to do those projects, we then have to negotiate with the city engineer as well as city DPW on the specifics on each project. And we're not allowed to let the contracts for that project until the City has signed off on them. So it's a very collaborative process. It requires a lot of interaction between the County consultants, our staff at the Water and Environment Protection Agency, as well as the City staff to make sure that we're all on the same page and that we're moving forward in unison. And then there's lots of updates during construction.

As far as maintenance is concerned, that's an ongoing issue that, at this point, because we've made the investment -- and I think Charlotte hit on this very well by suggesting that when you do put these in, you should make sure there's a three-year maintenance requirement in the contract. And that's very helpful to ensure that you're going to get a nice build-up of your materials and a nice replacement of them if they happen to fail in the first one or two years. We're getting smarter at that, too. But in the near term, we're taking the responsibility to do the maintenance, but we're also trying to give the City an easy way to maintain these systems by linking them into our asset management system, giving them the right tools as far as knowing when maintenance should occur, the right updates through software, hardware, or hard copy, if need be, to get them done. But in the near term, we're maintaining a close eye on all of the assets we've put in place to ensure that they continue to function at a high level. And over time, we will transition that maintenance back to the City and hopefully in a way that doesn't add too much burden to their ongoing operations.

Eva Birk

Great. Thanks for clarifying that. That sounds like a complex process, but effective. Thank you. So the screen that I have up now, that I pulled up on my end that you should be able to see now has the contact information for both Matt and Charlotte and also the contact information for Emily and myself, if you have any questions about the series or want further information. So we did have a lot of questions about slides being posted online. The slides from this presentation, as well as a transcript, will be posted on our EPA green infrastructure website within about a week or two. So stay tuned for slides if you'd like to share them after this presentation. And then, if you can see my arrow here, I'm pointing to the place where we have a link to the technical assistance report that I mentioned earlier in opening remarks.

Matthew Millea

It's a great read.

Eva Birk

It's a great read. Matt says it's a great read. So Charlotte, I'm going to unmute you now and give you a chance to answer a question with Matt that was posed multiple times, and that is about contractors. So in terms of getting from A to B in green infrastructure implementation, there's a certain level of training that has to happen with City staff, County staff, Public Works Department staff in particular. But we had several questions come in about training or messaging to contractors that are new to green infrastructure practices. Do you guys have any lessons learned along those lines or any experiences that you could share?

Charlotte Katzenmoyer

I'll go first, Matt, if you don't mind. Yeah, we've actually felt that the contractors are becoming a lot more experienced in the green infrastructure practices as we've done -- as we've completed

projects. I think the most important thing is to make sure that, during preconstruction meetings that your engineer or your City staff, whoever is conducting that, go through a lot of the fine-tuning or fine messages that are required under the technical contract for green infrastructure - for instance, not compacting soil. The typical contractor methodology is to compact soil before they put down pavers or asphalt, and you want that to be – to remain porous. So it's really making sure that you pull out a lot of that fine-tuning that needs to be done and highlight those during a preconstruction meeting to make sure that the contractor understands that. And of course, as it is with any public works project, inspection is really important.

Matthew Millea

It's going to be a huge challenge, and it's, again, a growing process. And I think every community is going to go through the same evolution, where the contractors will get better at it over time. We've seen tremendous improvement over the last three years from where we are with contractors, and now they're really into it. They market it. They benefit from it. And Charlotte's absolutely right – it's all about the pre-meetings, the construction monitoring, and then the post-construction inspection. But things will get screwed up. These outfits are used to doing things the same way for a long time, and you just have to accept some of those errors will be lessons learned for the entire team.

Charlotte Katzenmoyer

Yeah, we're learning how to do this, and we keep telling our residents that, as well. I mean, we just had -- the rain gardens that we did at Lancaster Brewing Company, we just pulled them out this week and put them in Brandon Park because they were taller types of shrubs that didn't stand up to the snow plowing. So lessons learned. Now we know that we need to concentrate more on ground cover in an area where we're getting snow turned over by plows. So it's a learning process.

Matthew Millea

Exactly. And I think the report on the cost benefits that was mentioned earlier is incredibly important, is that if you spend ten or \$15,000 on a project to redo a certain failed element or something that you learned from, it doesn't mean the program is a failure. They are simply just learning opportunities, and the team should benefit from that experience rather than feel that they failed.

Eva Birk

Great. Well, thank you both for your comments on that, and I'm sure we could go on for hours, talking about different experiences and lessons learned. And that really is how you get to a level of implementation that's going to achieve big results, is by getting these kinks out of the way early on in the process. So thank you both for taking the time today to share some of your early experiences in doing wide-scale implementation at the county level and at the municipal level. And we'll make sure to share your presentations on the EPA green infrastructure website that I've marked here. And if you have any other questions about the series, make sure to contact Emily or myself. So with that, I'd like to thank Charlotte and Matt for joining us today and all of our participants for listening in, and please continue to check out EPA's green infrastructure website for the most up-to-date information on our series. And join us next time in July on green infrastructure and climate change. That's our next webcast topic, so make sure to tune in then. So this ends our webcast for today, and thank you both for joining us.