USACE ERDC

Moderator: Julie Marcy
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Julie Marcy: Hello everyone this is Julie Marcy your host. I work at the ERDC Environmental Lab in Vicksburg, Mississippi. Welcome to our Dredging Operations Technical Support webinar series. This series of Web meetings is intended to share topics of concern to the National Dredging Program. The Web meetings are recorded and archived files will be posted on the DOTS resources tab and you should see that URL address on the introduction slide on your screen.

Additionally, I want to remind you that professional development hours are available for attending our DOTS webinars. If you would like to earn a PDH please submit your full name, affiliation and e-mail address to me, Julie Marcy, via the chat feature before the close of the meeting and I'll e-mail your certificate to you. Just a few notes before we begin today's session. I ask you to please keep your phone on mute. In a few minutes I'll also be applying a listen-only feature to mute all participants until we get to our question and answer session a little later in the program.

During the presentation, if you have a question after we apply listen-only, you can use the chat feature to ask a question. Our speaker will be using the shared desktop feature and once we go to that mode, your chat box will actually move to the top of your screen. You'll see a little green dot at the top of your screen above the slide image and if you'll click on that it'll show you a place to see the participants list and to bring up your chat box again. You can enter a question there if you have one during the presentation.

When we get to the end of the presentation for our main question and answer session I'll open it up to everyone. Following the presentation, you may still need to take your phone off of mute even once I release the lines or you may need to do a Star 6. If you're having trouble hearing or have any other technical difficulties, you can also use the raised hand feature to get my attention and we'll try to address your concerns at that time.

Lastly, in order to have a more comprehensive list of attendees, if it's not already apparent in the participant list, I would appreciate having your full name (both your first and last name) and your affiliation. So, if you could take just a moment to use the chat feature to add that. For instance, if I just have a first name, you could go ahead and add your last name for me or if you did not add your office or your organization affiliation if you could add that for me (Julie Marcy) I'd really appreciate it.

If you're calling in as a group, I'd appreciate information on your group attendees as well. And with that, I'll give you a little more information about today's speaker who will be talking about the USACE Dredged Material Management Decisions Tool, also known as D2M2.

Our speaker is Matthew Bates. Matthew is a Research Environmental Engineer at the ERDC Environmental Lab. His work focuses on research and applied projects involving decision-making under uncertainty, multi-objective optimization, synthesis of technical data and expert judgment, mathematical modeling, spatial analytics, and civil and environmental engineering.

He leads teams applying these methods to complex problems related to sediment management, physical infrastructure, water resources, emerging material risks, and natural engineered systems in support of ERDC research

programs, USACE districts, the Department of Defense, and other federal agencies.

Matt is involved in and has held elected positions in several professional societies and has previously worked as a financial-risk-analysis software developer for KPMG, LLP, and he developed a US-Jordan teacher exchange program while living and working in the Middle East. So, he has quite a diverse background. More information about Matt may be found in his biography posted with the presentation. We will be posting the archived recording of today's meeting on the DOTS Web page.

So Matt, we're very happy to have you presenting to us today and if you'll give me just a moment I will assign you presenter rights and then I will assign the listen-only feature. I just gave you presenter rights. You will be using the shared desktop feature. Give me just a moment for the listen-only mode.

Operator: All participants are now in listen-only mode.

Julie Marcy: Okay and you may need to do Star 6 so that we can hear you Matt.

Matthew Bates: All right. Thank you Julie.

Julie Marcy: Great.

Matthew Bates: Okay. Can you see my desktop?

Julie Marcy: Yes, I see your first slide.

Matthew Bates: So hello everyone. I'm Matthew Bates with the ERDC Environmental Lab. Today I am going to be talking about D2M2. So, a little bit of context for why

tools like D2M2 are important and the benefits that they can provide. As you all probably understand, dredging is big business for the Army Corps. We spend about a billion dollars on it every year and it secures access to over 2 billion tons of commercial shipping plus access for national security and recreation, as well as many other benefits.

But dredging can be complex, especially if you're dealing with large systems over long time horizons involving many different objectives that might be competing, or have interactions between project details and constraints that have to be considered. Some of these complexities might typically include having multiple stakeholders with opposing interests that you need to take into consideration, having a public interest in both minimizing costs and minimizing environmental impacts, having a large number of project variables and factors that all have to be juggled to find a solution, or having limited availability at placement sites and limited timing for when those sites can be used.

In this context, our team -- the Risk and Decision Science Team of ERDC -- thinks that decision analysis and multi-objective optimization tools like D2M2 can be helpful. D2M2 stands for Dredge Material Management Decision, a tool originally developed by the Army Corps a couple decades ago. It saw some use but it was time for it to be brought into the modern age with new technology and some revitalization, so our team took over creating the next iteration, the newest version of D2M2, funded by ERDC through the DOER research program, the San Francisco District and a bit from the New England District.

D2M2, in the new version, has three modules; optimization was the main emphasis before and that's still the brains of D2M2, where most users are going to be building their system. Here is where you create a digital

representation of the physical system that you have out in the field with dredging sites, placement sites, different routes and links between them, criteria to be traded off, and technical details to be considered.

In addition, there's a separate Decision Analysis module that could be useful as a screening tool for evaluating potential sites and management plans. And, there is a GIS module that we have as a plug-in to Arc GIS. So if you have a lot of data already in ESRI products, or you want to pull data directly from some national data sets like the National Channel Framework, the D2M2 ArcMap plug-in can be a way to directly access that data with minimal overheard to get it from where it exists into D2M2. And similarly there is an Excel upload template. If you have a lot of data in Excel, you can bring that into our template and batch upload it all at once.

So a little bit of detail about what's going on behind the scenes with the optimization module. More than being a model, we think of it as a model-building tool. It provides a user interface where you can drag and drop to create an optimization model. Behind the scenes there's mixed integer linear programming code running but, as a user, you are interacting with icons and text boxes.

Rather than having a one size fits all model formulation, it's flexible because each case, each project, might have different needs that need to be considered. So it's a flexible approach. Typically a user will want to have some set of objectives. That could be either a single objective to minimize cost or multiple objectives, to balance costs and environmental impacts, for example. You can also enter a set of constraints related to the volumes, maybe some user-defined limitation on the system, add a bunch of data related to variables for costs and impacts and effects, and which sites -- sources and sinks -- can be connected and which ones can't be connected, that go into building the model.

One useful feature, in addition to having the model tell you this is the single most optimal solution and it gives you the highest numerical score, is an ability to explore a near-optimal solution space. So, to say “Okay, I’ve seen the optimal solution that the model suggests; I’ll take that with a grain of salt. Now I want to step back for a moment and exclude that single solution and explode the other solutions that are near-optimal,” which gives a broader perspective into how you might want to manage your system.

And this is implemented in Java with LPSOLVE being the brains behind the optimization. Here is a screenshot of the optimization module. So in the center is where you build your user-defined system. Here we have just a simple system with two dredge sites, the blue dots, three placement sites, the red triangle, one transfer site, and some links connecting dredge sites to placement sites. (Links might be everything-to-everything or might be limited with some material only being available to go to certain places.) On the left, there’s a list of all of the data in the system, in the model, including all of your dredging sites, your transfer sites, placement sites, and the links, etc. So you can quickly select something there even if it’s not visible on the screen. On the right are property boxes. Right now, it’s showing general system properties. If you click on any one of these features it’ll give you the specific properties for a dredge site where you can enter volumes over time, or for a placement site where you could enter cost and lease details, for example.

As you’re going through and building the model, the typical data that I’d imagine a user working with would be some list of dredging sites that are identified as needing to be dredged over time at certain volumes, a list of placement sites and the capacities associated with those placement sites over time, any transfer sites that might exist -- and transfer sites are optional; you can just use an average cost from point A all the way to point B, or if there are

for different sections of that transit you can have a transfer site in the middle with different cost curves on either side of it, say at a dewatering facility -- and then other associated details, technical details related to costs and benefits, timelines, material reuse potential, and constraints, etc.

We have the list of source and destination sites, the links that connect them, and then the specific cost curves that tell me how much will it cost to get from point A to point B (or, if it's not cost, what will the environmental impact be of getting from point A to point B). These data could be specific for each pair of sites or could be generalized by the type of equipment used or by the distance, or something like that.

Here are two case studies that I'll talk about today. The first, Long Island Sound, is a case study we worked on over the past two years. And then Galveston Bay and the Houston Ship Channel is an ongoing project where we've completed the first phase and are working into the second phase.

Long Island Sound: this project uses data that was produced for the LIS Dredge Material Management Plan. This graphic shows expected dredging needs for the region. Over a 30-year period, almost 40-million cubic yards of dredge material need to be taken somewhere. So that sets the stage for where D2M2 can come and help design an optimal dredging plan.

In the Long Island Sound model, first we build this system network that identifies all the dredging sites and the placement sites and connects them. We added the volume and capacity information.

We're modeling this over the 30-year time horizon in six different five-year chunks. Here are basic details about acquisition time frames, costs, leases,

when a placement site will and won't be available, and the associated technical details for transfer sits and constraints.

Constraints can be really flexible and give you a lot of capacity as a user to play "what if" games with the system. And this is, I think, one of the most valuable ways that you can use D2M2 to help plan your decision making -- to run different scenarios like: "what if I added a new site?" "what if I add a constraint that says these sites aren't available in certain years?" "what if I add a constraint that says open water placement has to be this much or can be no more than that much?", and see how that changes the outcome recommended plan of where material should go and the costs and effects associated with that.

So these are the data going into the Long Island Sound model. To support the Dredge Material Management Plan, the New English District's cost estimating team came up with a lot of cost estimates looking at different placement types -- not specific sites but types of sites -- for each different type of dredging equipment that could be used and over different distances. This gives us another subset of cost data to pull from. This first graphic shows costs up to five miles and then, for those types of equipment that can be useful beyond that, another graphic going all the way out to 60 miles.

In addition to a cost model, we can have an expanded model with both costs and effects. Drawing from some other reports prepared for the DMMP, a number of types of effects were mentioned that might also be associated with placement at a specific area: cultural effects, environmental effects, infrastructure effects, and physical effects. The reports didn't go through and score each placement site with respect to each one of these areas but we, as the model builders, went through and used our judgment to read the reports and give a one to four score for each site that we were modeling with respect

to each one of those criteria. Here, positive scores represent impacts and negative scores represent benefits for each one of the placement sites.

This next slide shows the system network. Here we're showing straight lines just indicating connectivity and not the actual route that would be used. The blue dots represent dredging sites, the red triangles placement sites. This is a screenshot from ArcGIS. And then the next screenshot shows the same network imported into D2M2. Those are all the sites.

On the left you have your list of features that you can access and, as soon as you click on one, the properties panel on the right will change. Once we had all of these data we built our model. We ran three different scenarios to play those "what if" games. The first scenario was cost-centric; we put all the weight on costs. We just wanted to minimize costs, that was the only concern in the model.

The second scenario was entirely effects-centric, asking, "if we ignored cost, what would an effects-based result look like," just so we can compare the two scenarios to each other. Weights were split evenly across those four effects categories. We also ran a 50/50 balanced scenario that equally considered costs and effects.

The results, as you might expect, for the cost-centric scenario favored open water disposal with minimal other uses. The effect-centric scenario favored beneficial uses with minimal open water placement or landfill placement. And then the 50/50 scenario shows an interesting mix of open water, landfill, and beneficial use placement depending on the details for each site pair; depending on how the costs, locations, and effects play out given the distances for every possible combination in the system.

To look at those results, here is a screenshot of the main page of the report -- a typical screenshot of one page of the report. (And we have a new version of D2M2 coming out in a month or two that will have this also directly exported into an Excel template that can be imported into a visualization tool so you won't have to flip through a PDF. You can instantly see a map of your output.)

That is a summary, so here is a detailed example: from the Norwalk Area dredging site these are all different potential placement sites. In this example, the model recommends taking no material to Jacobs Beach in the first time period and taking material to the town of Brookhaven Landfill, in the fifth and sixth time periods, taking material to the Little Bay Borrow Pits, and in almost every time period taking material to Western Long Island Sound, which is the open water placement area. That gives the details of the volumes and the costs in this case.

This is a summary that shows for all of the dredging areas and for all the placement areas, the total volume that was moved over the entire 30-year period and from what range of years, so from years five to six here, only in year two here, from years two to six here.

Here, we show results graphically on a chart. If we add up all the costs and all the impacts or effects, how do those play out across the three different scenarios? In the all cost scenario, as expected, we have the lowest cost and the greatest effect. In the environmental (or other effects) scenario, we have the greatest cost and the lowest impact, and in the 50/50 scenario we see a mix, something in between.

But what's interesting is to see how the 50/50 scenario is non-linear with respect to the two endpoints. With costs, we almost have even scaling. If you

focus entirely on costs, you'll get the lowest costs, and as you move weight away from cost only, you'd expect to get greater and greater cost coming into the system and being seen in the result. But with the effects we see something different.

If you consider effects at all, here 50/50, you get almost as much benefit as if you considered effects exclusively. So we could have done even more runs and found some additional points in the middle here to try and see, if I were seeking a partner outside of the Corps of Engineers who wanted to cost share, where could I get the greatest score for minimizing impacts for the least cost, in a way that would help me balance my needs as a Corps project planner with the needs of the project partner.

That's one example for how a D2M2 model can play out. The second project I am showing is with the Galveston District: Galveston Bay and the Houston Ship Channel. This is a project that we worked on last year in phase one of the larger project (project two we're going to be working on this year.) So the first project was looking at the Houston Ship Channel and the second one will be the Gulf Intracoastal Waterway. The Houston Ship Channel is what I'll be modeling today.

This is a larger project, including our team with D2M2, a collection of other ERDC researchers with their own tools, data coming from the district, the USACE Mobil team providing their own data and access to national databases and visualization tools, such as the project viewer that everything is feeding here.

This graphic shows D2M2's place with respect to some of the other tools and types of data that might be considered in a large scale systems modeling

effort, things like where the different dredging quantities, placement areas, environmental inputs, and some other Corps tools might come from.

This shows a screenshot of the Houston Ship Channel. Our first task is to identify dredging needs. Here, for dredging sites, we use the midpoint of each dredging reach to represent that site in the model. Bathymetry is one way of getting a picture for what needs to be dredged. We also had data for shoaling rates, which gives another image of what sites need to be dredged and with which quantities. We use a variety of these data to project into the future what sites would need to be dredged at which quantities.

So once you have your dredging sites established you also need to know your potential placement areas. The gray sites are our placement sites that aren't currently active. The colored sites are sites that are available for use, color coded with respect to remaining capacity: red ones that are almost full, green ones that have large capacity remaining, and yellow ones in between.

Here are details for the placement sites. We are mainly interested in things like the capacity and the type of site, which is useful if you want to create some constraints or rules for which types of sites can be connected to which dredging sites. So now we have our network; we have our dredging sites and our placement sites.

Separate from this, we also developed cost information by looking at historical costs in the region broken out by different types of equipment. Then we also wanted to consider some additional criteria to explore the broader picture. Some additional data available to us for the case study are shown here. We looked at oil and gas active leases in the region. We also looked at sightings for endangered species which might be relevant for environmental impact and habitat concerns from dredge material placement in the region.

Here is data for oyster beds, which yields another type of criterion for what you might want to avoid when placing material. And, here all of those impact layers shown together.

In this graphic, we show the data coming from the GIS plug-in and also from the Excel upload spreadsheet. I didn't bother laying the sites out like I did for Long Island Sound in a representative format and just took the default format because I had all the data already provided via batch upload. This is just a screenshot of D2M2 and the model.

Here are the four criteria. (First it was run with just cost being the only criterion considered, but then we played with the other criteria as well for an alternative solution.) Here are some screenshots of the upload templates showing how you can hand fill-in or copy and paste the data: project properties, equipment, the different links connecting source and destination sites.

Here is a screenshot of the ArcMap plug-in. If you're connecting to the national channel framework or some other data that you have already in GIS, you can use D2M2 to bring data in through this plug-in as well.

Here are the results. We ran the two scenarios: minimize costs, and balance between costs and the different (equally weighted) impact categories. The light blue is the cost-minimizing result, the dark blue is the balanced result. And so between these two scenarios you see that cost increases, understandably. If you consider other factors you'd expect to get fewer impacts. We see negligibly less impact to the endangered species in the area with the species sighted areas as a metric for that. We see a reasonable decrease in your impact to the oil and gas leases.

Those were the summary results tallied up into a single total cost or impact score for each scenario. These are screenshots of that viewer as I talked about that the Mobil district had been working on. Here, we've brought in all of the other data that a decision maker might want to see but also the D2M2 results showing the two different scenarios. So first this is the minimize costs scenario, and again just showing straight line logical connections, not the actual route (because if you showed the route everything would follow the channel and it would be hard to see what went where.) So material is largely going to placement sites that are nearby and available, for you to minimize costs.

Here are the results for the balanced case where we say cost is only 1/2 of the objective and the other 1/2 of the problem is to minimize impacts to those other criteria. We see right off the bat the material is traveling a lot farther. Some of the sites that had been used nearby are not being used; the material is going farther away to some of these distant sites that had less impact on the oil and gas leases, the endangered species, and oysteries. So I can just toggle a couple times back and forth to give you a view of the differences between these two sets of results.

So between the numerical results, the graph showing the totals where we just tallied up all the costs and the impacts, and then this visual breakout of results for where the model suggests material should move under an optimal plan, that gives you a summary of what comes out of D2M2.

Also, in the viewer you can also click on the links and the placement sites. So here clicked on something, a link going from reach number six in the Houston Ship Channel to the Lost Lake Placement Area under the minimize costs scenario, with this volume transferred. So, you can dive into the details in the

viewer as well. That was for the cost case and these are similar results for the balanced case.

In conclusion, D2M2 is a model building tool using multi-objective optimization, taking a spatial approach that helps users solve complex and multi-faceted problems related to dredge material management. D2M2 might be useful because it helps you explore a larger set of potential solutions than you'd typically look at by hand. Once you've gone into the tool and built your model it takes very little effort to generate those "what if" scenarios. The hard part is getting everything set up the first time. So it enables explicit consideration of multiple objectives, if that's within your mission or something that you want to explore either formally or informally, perhaps if you're partnering with other stakeholders or if you have environmental considerations.

Because the model is built out transparently and you can show the data to anyone, this might help justify decisions being made. It helps you to show opportunity costs and benefits from different policy scenarios. So as you play those "what if" games you can come back and say, "well we know the model is not perfect but it does help us give a view of the order magnitude costs that we might incur from using this policy or this scenario instead of another, or the benefits we could reap if we change some constraints, such as if we alter our agreements with another agency."

D2M2 adds transparency and replicability to the analysis. Anyone else can pick up the model once you've built it and shared it and see what you've done and all the details that go behind that. And then it enables that scenario analysis, again, for future conditions.

So that's all I have to show from the slide deck and I'd be happy to take any questions. Thank you.

Julie Marcy: This is Julie. Thank you Matthew. Give me just a moment to open up our lines.

Operator: All participants are now in interactive talk mode.

Julie Marcy: Matthew if you will select that stop sharing button on your computer. There we go. Let me go ahead and move over to the slides. We'll open the floor to questions. Remember that you may need to hit the mute button or Star 6 button on your phone even though I've opened up the lines. At this time, we'll open the floor to any questions or comments you may have for Matt. And please identify yourself when you speak.

(Jim Clausner): Hi, this is Jim Clausner.

(Jim Clausner): For those of you who don't know me I used to work for ERDC for the better part of 30 years. I'm a sub-contractor still working for the Corps. A question for you Matthew: when you do the impacts, how sophisticated are your impacts? In other words, I assume you're looking at re-suspension from different types of dredging, things like that. Are you actually running a sophisticated model of impacts or do you have something a little more subjective on your impacts?

Matthew Bates: It's really up to the user. And that's a great question. D2M2 is really the tool that aggregates all the data that you have available and puts them all in one system where they can play off each other. So there are no physical models, mechanistic models in here that are running physics equations or hydrodynamics or anything like that.

So in most cases, we had data for different areas of concern so we could look at the percentage of a placement site that crossed over with an oyster bed or that had recently had endangered species sightings. But if you have more sophisticated data, then there's no reason not to use that instead.

Jim Clausner: Okay one other quick question and I'll let other people have a chance. If you are going to be transporting dredge material long distances does it look at the fact that as you are perhaps minimizing impacts at the local placement site or the nearest placement site you're also providing opportunities to resuspend that material if you're dragging it in a barge 20 or 30 miles. Is that factored in by any chance?

Matthew Bates: It can be. Again the criteria that you run with are up to the user.

Matthew Bates: So if you had costs, you had local impacts, and you added a criterion that listed impacts from re-suspension and you had data to back it up -- you could easily throw that into the model and see how those factors played off each other.

Jim Clausner: Okay thank you.

Julie Marcy: And Matt this is Julie. We've had a couple of questions come in on chat. The first one is does the model use the eCoastal database?

Matthew Bates: Indirectly. So I think the ArcGIS D2M2 plug-in can access things from eCoastal or ArcGIS can be the connecting point to bring data from eCoastal into D2M2 through the plug-in.

Matthew Bates: But they're not a part of each other.

Julie Marcy: Okay. And the other question on chat: Can you give us an idea of the estimated cost of setting up the model?

Matthew Bates: It depends how detailed a model you want. Typically it's a couple months effort at a minimum I'd say. In the work that we're doing with Galveston there's a lot of work that went on behind the scenes at the district to get all of their data in place before it comes into D2M2, and really that's the hard part. Actually taking available information and putting it into the tool and running it, that can be done relatively quickly. So, I don't have a single number, but it depends on the scope of the project.

Julie Marcy: Okay. And folks if you could go ahead and put your individual phones on mute if you're not asking a question please. And remember too if you want to earn a PDH certificate please send me that request in the chat. Any additional questions or comments that you may have for Matt?

Remember you may need to unmute your individual phone. Another one on chat that that's come in Matt. Is there a user's manual for D2M2?

Matthew Bates: Yes, we have one.

Matthew Bates: There is one that comes with the software. We're updating it. We have a new version that we hope to roll out sometime in the next month or two so we'll need to further update the user manual for that. But if you have questions outside of that I'm always available for answering questions.

Julie Marcy: Okay. So maybe by the end of March or April you think you might have an updated version out?

Matthew Bates: Yes, something like that.

Matthew Bates: It will go to the DOTS models Web page.

Julie Marcy: It will be on the DOTS model Web page. Any additional questions? You can send them in through chat or you may ask them verbally as you prefer. Also for those of you that tuned in but may not have heard my earlier announcement on the participants list, if only your first name is showing if you could just take a moment to use chat to give me your full name and your organization that would be very helpful to give us a more complete attendees list.

Several of you have done that using chat already and I really appreciate that. Any additional questions or comments for Matthew? I want all of you all to know that Matthew really put forth the extra effort today because, if you're not aware of it, he's located in the frozen northeast in New England - how much snow did you have Matthew the last couple of days?

Matthew Bates: I haven't seen the official total, but it looked like about two feet out front of my house.

Julie Marcy: Two feet. So we weren't even certain he would have power this afternoon. We were very fortunate that he was able to connect with us.

(Mark Wiechmann): Hi Matt? Matt?

Julie Marcy: Go ahead.

Mark Wiechmann: Okay. Question; do you have any funding for more case studies and would you estimate a dollar figure for what it would take to do a case study? This is Mark Wiechmann by the way, San Francisco District.

Matthew Bates: Hi Mark.

(Mark Wiechmann): Hey.

Matthew Bates: So, we have the recently completed case study with Galveston Houston Ship Channel and we have the second Galveston case study with the GIWW that we're doing this year. There is no one number I can throw out because it's so dependent on the scope and what data you have available and how hard it is to get that together, but I'm happy to talk to you offline to come up with something.

Julie Marcy: And there was another question on chat Matt. Are you looking for other projects or other areas to test the model at?

Matthew Bates: Yes definitely. So D2M2 been a couple years in re-development to get it to where it is now and I think now we're really at a point where we can turn it loose, especially with the next version that's coming.

Julie Marcy: Okay, so let Matt know if you might be interested in doing a case study with him for the model. Any additional questions? Don't be shy.

Cynthia: Julie, this is Cynthia.

Cynthia: It sounds like everyone may be tapped out on this but I'd just like to end with saying that I will work with Matthew to make sure that we publicize when the next version is available on the DOTS Web page. All of the participants

names look very familiar to me, so they already exist in the DOTS mailing list. I will send out something specific when the update is ready

Julie Marcy: Okay great, thank you Cynthia. And as always we will be posting the files from this webinar for you on the archive site. Matthew, thank you once again for - one more late-breaking question. Is there a plan for formal training for D2M2 or do you learn as you go?

Matthew Bates: There is no formal training plan, we're not teaching a Propospect course, but I'm happy to teach anyone who is interested.

Matthew Bates: Or you can learn as you go.

Julie Marcy: Okay. So currently no formal course but training could be provided as requested.

Cynthia: Julie this is Cynthia, just to interject again that that is another role that the DOTS program is happy to help assist with. If there is a group of folks in a particular district or division that would like to work with Matthew, then the DOTS program can work and try to make something a little bit more formal. So if there is interest, please let us know and we'll see what we can do.

Julie Marcy: So you might be able to do a training session for a district or a division. Any other last minute questions or comments? Well, thank you Matt and participants thank you for tuning in with us today. Please be watching your e-mail for some upcoming notices on additional DOTS webinars.

As always Cynthia Banks from here at ERDC Environmental Lab will be sending those notices out. And that will conclude our webinar. I hope everyone has a great afternoon.