



A newsletter for people concerned with water management issues.

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*An exterior view of a vortex valve
 in Weedon Bec, UK*



*MnAFPM & WAFSCM Combined Annual
 Conference—November 7th, 8th and 9th, 2009*

Message from the Editor

The WAFSCM newsletter is published twice a year to update members on chapter activities and to provide information on publications, seminars, etc. that may be beneficial to our water community. If you have articles, announcements, or other information that you would like us to include in future newsletters, please forward it to me at cindi.debruine@rasmithnational.com.

We want to thank Rhonda Janos of R.A. Smith National for the updated look of the newsletter and thank R.A. Smith National for donating the preparation of the newsletter.

Cindi DeBruine
 Newsletter Editor



Message from the Chair

I am honored to be serving as the current Chair for the Wisconsin chapter. As I look back, I am truly pleased to see the changes our association has gone through in the past couple of years. Thanks to Cindi DeBruine's efforts a few years back, we are now classified as a non-profit organization and are no longer skirting the IRS for unpaid taxes (that's a good thing). Thanks to Dave Fowler's efforts this past year, we have successfully executed a joint conference with the Minnesota's chapter. We now have a website that provides vital information to our members. We've even gotten some Illinois folks "hooked" on our annual conferences because they have expressed a preference for ours. Our membership is steadily growing and as we move forward into 2010, I am excited about what lies ahead for our chapter.

One thing that I was recently forced to examine was our mission as a group. Someone recently pointed out that they felt our group was intended for floodplain managers more than anything else. While it's true that we place great emphasis on floodplain management and the CFM (Certified Floodplain Manager – not to be confused with Certified Financial Manager) program, we really should fall back on our association's name: WAFSCM. The acronyms "F", "S", and "C" are given equal billing. With that said, as we move forward in planning our next conference as well as other activities this year, let's go back to the basics and realize what our group is about. With our by-laws, we are tasked with "promoting the common interest in floodplain, stormwater, and coastal management" – as well as to "enhance cooperation between the various related private, local, regional, state, and federal agencies". Furthermore, we are to "encourage, and ensure effective, new and innovative approaches to managing the state's floodplain, stormwater, and coastal systems..."

So, I challenge all our members to evaluate our group and help fill in the voids. I'm lucky enough to have insight into the Illinois chapter. I recently attended their conference and also sat in on their board meeting with Dan Cook. Their goal is to improve their membership from the 650 range to over 1,000 by June 30! At their board meeting, Dan and I approached them on doing a joint conference in January 2013 with Minnesota and Iowa – making a "Quad-state" conference. There is so much our chapters can learn from each other. Meanwhile, we have our annual conference to plan for in November. Please forward all ideas on speakers and topics that you would like to see at the conference. This is your conference and we want to do all we can to make it successful!

Since, as a group, we are still in our infancy, there is so much room to help steer us to do what is best for Wisconsin's beautiful floodplains, wetlands, coasts, and stormwater features – all of which contribute to making our lives more pleasant. The best way to help steer our association is by participating. Volunteer to help with what interests you! Check our website for the various committees we have and join one today!!!!

Respectfully Submitted

Minal Hahm, P.E., CFM
Chairperson



Flood Buyouts Underway

As a result of the 2008 flooding and subsequent federal disaster declaration, nearly \$30.9 million was made available in Wisconsin to implement mitigation projects through the Hazard Mitigation Grant Program. Per the priorities as established in the Wisconsin Hazard Mitigation Plan, acquisition and demolition of flood damaged properties was the highest priority for funding. Primary residences that were deemed substantially damaged (over 50% damaged) per the local floodplain management ordinance received first priority. Applications were submitted to FEMA for 16 communities totaling \$30,608,082 for acquisition and demolition of 214 structures. At this time all but amendments for two communities have been approved and funds obligated.

Due to substantial damages, almost all of the structures have been vacant since the flood and property owners are waiting for offers from the local community. Property owners are offered pre-flood fair market value

for their properties. The assistance will allow the property owners the ability to purchase replacement housing outside of the flood risk area. The local community will own the properties after acquisition with permanent deed restrictions. Open space uses are the only allowable uses for the property after acquisition such as parks and recreational facilities, flood water retention, etc.

Nine of the communities have completed the appraisal process with appraisals underway in the rest of the communities. Forty-one properties have been acquired in five communities with many more scheduled for the near future. Demolitions are underway in at least one community.

The Hazard Mitigation Grant Program is administered by the Wisconsin Emergency Management.

For more information, contact WEM Mitigation Staff at 608-242-3211.

COMMUNITY	PROPERTIES	AMOUNT
Elroy	6	\$572,000
Excelsior	1	\$121,800
Fond du Lac	14	\$1,642,410
Gays Mills	12	\$1,098,006
Grant County	5	\$467,300
Janesville	9	\$1,244,750
Jefferson	3	\$499,830
Jefferson County	46	\$8,087,681
Kenosha County	17	\$2,488,118
LaFarge	15	\$1,195,675
Paddock Lake	6	\$688,610
Reedsburg	20	\$2,602,770
Richland Center	1	\$113,500
Rock County	6	\$1,172,709
Rock Springs	20	\$2,512,786
Spring Green	28	\$5,377,624
Sugar Creek	5	\$722,513
TOTAL	214	\$30,608,082



Vortex Valves: Flood Prevention Tools Catching on in UK Dam Projects

By Robert Y.G. Andoh

Professor Robert Y.G. Andoh is Chief Technical Officer and Executive Director at Hydro International Inc.

The 100,000 or so dams that operate in the U.S. serve a variety of purposes. More than 30 percent are used primarily for recreation. About a fifth of the dams were built primarily for fire protection. The third most popular use is for flood control (16 percent), followed by irrigation, water supply, hydroelectric, fish and wildlife, mining, debris control and navigation.

Dams used for flood control are particularly important for public safety purposes, because if they fail the runaway floodwaters cause extensive damage to local communities. Among the more destructive dam failures in the U.S. were two that took place in the 1970s – in Buffalo Creek, W.V., where a 16-mile valley flooded, killing 125 people; and near Rexford, Idaho, where the failure of the Teton Dam caused up to \$2 billion in property damage and killed 11.

To protect against downstream flooding in heavy rain events, engineers typically deploy two principal strategies. They build up the communities' flood defenses and/or they hold back the flood waters upstream.

Building up a community's defenses is an expensive and disruptive proposition. Municipalities must enlarge their existing conveyance channels or build up protective walls to ensure that heavy flows don't flood local streets. They need to

create higher embankments or shored-up levees. But that can be a challenge in many older urban areas, where residential and commercial projects have been built close to the channels. To ensure adequate protection, local leaders often have to resort to land takings.

Holding back flows is usually the more efficient, cost-effective way. To allow for a regulated flow downstream of the dam, and to protect against excessive, damaging flows, flood scheme designers deploy flow control devices upstream of dams.

These devices contain an orifice sized to allow a calculated flow that will proceed through the dam and get slowly released during a major flood threat. But the downside of holding back flows is that the practice creates floods on the other side of the dam. This creates a problem for farmers upstream of the dam: They don't want their land to flood every time it rains. And it often requires municipalities to resort to additional land takings of developments that fall within the expanded floodplain.

The challenge is to deploy a flow control scheme that balances the need to stop the damaging floods downstream of the dam and limit the protective flooding on the upstream side. In Europe, a number of dam projects have used vortex valves to help strike this balance. These valves are currently used in the United States for flow control purposes in urban drains and ponds, but they haven't been applied to dam projects.

Vortex valves act like natural hydraulic brakes. Designed with a snail or conical shape, high flows initiate a vortex within the valve which in turn restricts the flow of water out of the device. When head pressure builds, water circulates in a



An exterior view of a vortex valve in Weedon Bec, UK. The unit installed at Weedon Dam has the facility to adjust the controlled outflow between just over 2,000 to 3,000 gallons per second via the use of removable stop logs on its intake.

vortex pattern, allowing an air core to form within the device preventing excess amounts of water from entering conveyance systems such as channels through urbanized areas or combined sewers and other collection systems.

Under low-flow conditions, the valve acts as a large orifice where water and debris pass directly from the inlet to the outlet. As flow increases and reaches the flush flow point, high peripheral velocities start to throttle the flow. As pressure increases, an air core, accompanied by substantial backpressure, effectively restricts the flow through the outlet aperture.

Examples of the use of vortex valves in dam projects can be found in Weedon Bec and Glasgow in the United Kingdom.



MnAFPM & WAFSCM Combined Annual Conference

November 7th, 8th and 9th, 2009

Barkers Island Resort and Convention Center, Superior Wisconsin

In 2009 the Wisconsin Association for Floodplain, Stormwater and Coastal Management tried something different for the annual conference. In order to grow and learn, WAFSCM has long been discussing opportunities to hold a joint or combined effort with another state chapter or relative organization. Additionally, Dave has long promised Charlene Johnson (who works in Superior, Wisconsin) that we would hold a conference in the far north. A fantastic opportunity arose when the Minnesota Chapter, tentatively planning a Duluth event, agreed to join us in Superior. So for 2009, in the real Wisconsin northwoods, we had a combined conference with the Minnesota Association of Floodplain Managers. Judging from the comments, it was a great success for both organizers and attendees. The conference had over 100 participants, dynamic speakers, and workshops. We had an excellent mix of state, local, and federal officials as well as consultants from both states who participated as both attendees and presenters. Many participants at the conference took the opportunity to network within the relaxed, unique atmosphere. This interaction was by the far the highpoint of the conference for us. The opportunity to share and learn from our Minnesota co-hosts and our other out-of-state attendees was invaluable, both as an organization and professionally for all attendees.

The conference had a good mix of events and venues for the participants that covered all three days. There

were workshops, training sessions, and a field tour of stormwater management on urban streams. The final event was the CFM exam on Friday morning which was attended by 4 brave souls. All this was in addition to a full slate of plenary and concurrent sessions. The highlights for me were the plenary session presentations by Meg Galloway (WDNR) and Terry Zien (ACOE). Each covered



different aspects of the levee and dam safety issues that we are now facing both at a local and national level. Meg also highlighted the ongoing work that the state of Wisconsin has been doing in and around Lake Delton. This was an update on the presentation that was given by Bill Sturtevant at the 2008 WAFSCM conference. We also had excellent presentations at the afternoon plenary by FEMA Region V for a federal perspective, and Gary Heinrichs and Ceil Strauss from the Wisconsin and Minnesota

Department of Natural Resources, respectively, on the state perspective on the NFIP and host of other topics.

In addition to the plenary presentations, we had a repeat by popular demand of the No Adverse Impact (NAI) workshop produced by the National Association of

State Flood Plain Managers. The workshop was conducted by Dave Carlton from the Seattle, Washington office of PBS&J. The workshop was attended by approximately 30-40 people. There was also a Review Session for the Certified Floodplain Managers exam which was taught by Dave Fowler and Ceil Strauss on an emergency basis when the regular instructor Jen Marcy of PBS&J was stranded in Toledo, Ohio by weather.

We hope to continue the organization's success in 2010. Look for information on our November 3-4, 2010 conference in this newsletter. A call for papers will be out in the near future, followed in fall by a brochure and registration materials. You can also find information at our Web site <http://wi.floods.org/>. We are also talking with Minnesota about another joint conference in the not so distance future so stay tuned.

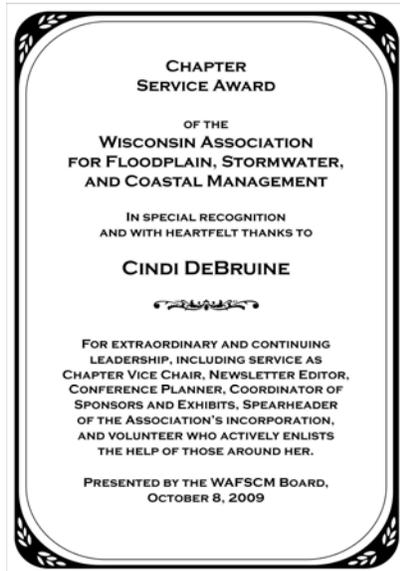
Thanks

Dave Fowler & Charlene Johnson
Conference Co-Chairs

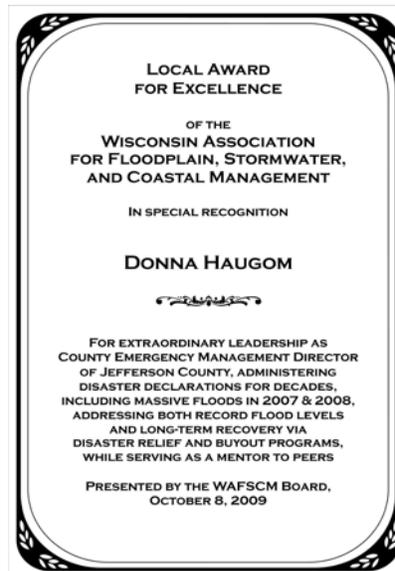


WAFSCM Presents Three Awards

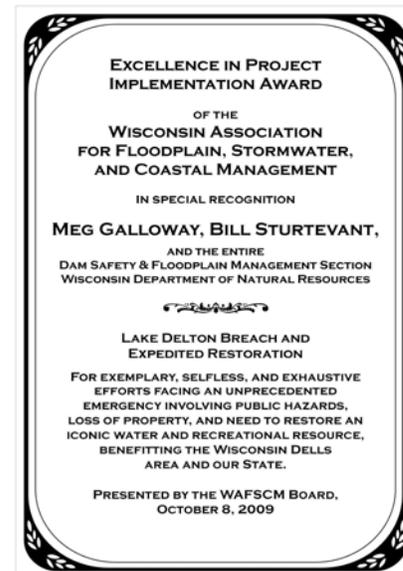
At the Annual Conference last fall, WAFSCM presented three awards to honor outstanding individuals and their accomplishments in the field:



Cindi DeBruine – Chapter Service Award



Donna Haugom – Local Award for Excellence



Meg Galloway, Bill Sturtevant, and the WDNR Dam Safety and Floodplain Management Section – Excellence in Project Implementation Award.

Please see the text from awarded plaques to get a glimpse of the meritorious work contributed en route to these well-deserved awards. The growing WAFSCM awards program offers the following opportunities for recognition:

- The **Chapter Service Award** is intended to recognize individuals who, through significant accomplishments and/or long-term efforts, have clearly influenced the work of the Association to improve floodplain, stormwater, or coastal management in Wisconsin.
- The **Local Award for Excellence** is intended to recognize an individual, organization, program, governmental unit, or the like, which has contributed outstanding or essential work toward implementing sound floodplain, stormwater, or coastal management.
- **Excellence in Project Design or Implementation** was awarded for the first time in 2009. This category is a means to provide recognition focusing on particularly meritorious project efforts more so than individuals. Thereby, teams, firms, agency divisions, etc., may find a recognition niche.
- A **Lifetime Achievement Award** will be entertained for distinguished and extensive service, normally over the course of a career, toward advancing the cause and/or ideals of best practical floodplain, stormwater, or coastal management. This prestigious award may be given annually as warranted.

(Continued on page 7)



WAFSCM Presents Three Awards (Continued from page 6)

Please start thinking about the credentials of deserving candidates. In 2010, the Association will again strive to make award nominations a fairly easy and straightforward process. Basic information on the nominee(s) with respect to merit and accomplishments, and the relationship or perspective of the nominator (knowledge of award-worthiness), are generally all that will be needed. Brief supporting materials are acceptable, but extensive documentation will be discouraged. If appropriate, the Awards Committee may contact persons submitting nominations for additional information. A formal call for award nominees will appear in this Newsletter as the Fall 2010 Conference approaches.

Please feel free to direct any questions or suggestions, to:

Gary Korb, WAFSCM Awards Chair
UW-Extension/SEWRPC
Phone: 262-547-6721
gkorb@sewrpc.org

Thank you for consideration on behalf of deserving individuals, groups, and efforts.

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2010 WAFSCM Annual Conference

November 3rd and 4th, 2010

**Wilderness Glacier Lodge Conference Center
Wisconsin Dells**



The next annual WAFSCM conference is November 3rd and 4th at the [Wilderness Glacier Lodge Conference Center](#), which is part to the [Wilderness Resort](#) complex in Wisconsin Dells. This is an awesome complex and a great place to have a family trip. Please reserve the dates November 3rd and 4th, 2010.

We are narrowing down the theme for the conference, but we are open to suggestions. The two existing suggestions are Revising Rules Reviewing Watersheds and Healthy Watersheds Healthy Cities. Please contact Dan Cook before April 19th if you have a suggested theme. If you have a suggested presenter or

training program, contact Dan Cook soon so we can contact them to schedule a presentation or training at the conference.

To get involved on the conference committee contact Dan Cook or Minal Hahm, Co-chairs.

Minal Hahm
minal@msquaredengineering.com

Dan Cook
d.cook7@att.net



ASFPM Associate Director – Position Announcement

CLOSING DATE, June 1, 2010

BACKGROUND The Association of State Floodplain Managers (ASFPM) is seeking qualified candidates for the position of Associate Director. ASFPM is a national non-profit, professional membership association with 14,000 members and 29 Chapters throughout the U.S. Established in 1977, ASFPM is a volunteer led organization with direction provided through a 19-member Board of Directors composed of nationally and internationally recognized flood hazard professionals, academicians, and professional private sector representatives. Our mission is to promote policies and programs which:

- a. Reduce the loss of human life and property damage from flooding;
- b. Promote pre-flood mitigation measures to prevent flood loss;
- c. Avoid actions that exacerbate flooding and flood damage; and
- d. Preserve the natural functions and the cultural values of floodplains.

RESPONSIBILITIES / OUTCOMES The Associate Director will assist the Executive Director with overall leadership and management of the organization's activities and finances, and will help develop Association positions on national policy, represent the Association in national policy dialogue, and build relationships with Congress, the Administration, other agencies/partners and organizations. All of these are subject to the Constitution, Bylaws, and direction of the Board of Directors of the Association of State Floodplain Managers (ASFPM). It is anticipated that this position, given exemplary performance, will transition to the position of Executive Director in one to two years. Therefore, the experience, education, and skills sought will parallel those that would be desirable in an Executive Director.

QUALIFICATIONS / EXPERIENCE The successful candidate for this position must possess/demonstrate:

- Bachelor's Degree or higher
- Minimum 10 years experience in progressively responsible management positions
- Excellent organizational aptitude
- Strong written and oral communications skills
- Successful project development and completion
- Demonstrated proficiency with personnel as well as financial management
- Works well with others, particularly at policy levels and in high pressure situations
- Experience in floodplain management disciplines
- Knowledge of and direct networking among FPM industry players and issues (active participation in related professional organizations is a plus)
- Strategic thinking capability
- Experience with National policy formulation
- Congressional and/or Presidential Administration liaison experience
- Firm understanding of and belief in ASFPM's mission and goals

POSITION ASPECTS This is a full-time position, located in the ASFPM office in Madison, Wisconsin, reporting to the ASFPM Executive Director and working under the direction of the ASFPM Board of Directors. Travel obligation is 25-50% time. Salary and benefits are commensurate with qualifications. ASFPM is an Equal Opportunity Employer.

APPLICATION PROCESS – Response deadline is June 1, 2010. References will be requested and contacted from the top 2-5 candidates. Please include the following in your response:

- a. Cover letter outlining your specific credentials and why you believe you are the appropriate person for this position
- b. Job resume detailing your experience and qualifications
- c. Two writing samples that you wrote on flood-related policy
- d. Examples of previous management experience

Email application to: ASFPM Executive Office, Diane Brown, Communications & Events Manager, Diane@floods.org

Released 4-1-2010

WAFSCM



Association of State Floodplain Managers, Inc.

2809 Fish Hatchery Road, Suite 204, Madison, WI 53713

Phone: 608-274-0123 Fax: 608-274-0696 Website: www.floods.org Email: asfpm@floods.org

Update of Federal Executive Order on Floodplain Management —in the Works?

Introduction

Executive Order (EO) 11988—Floodplain Management was signed by President Carter in 1977. Since the floods of 1993 it often has been suggested that the EO needs to be updated to reinforce the importance of floodplain management in federal policy and to make some minor adjustments to reflect contemporary issues that have a bearing on management of floodprone areas. The huge losses from flood disasters in the last 20 years have punctuated the need for federal leadership to reduce the nation's exposure to preventable flood risk.

During the first half of 2009, it was widely known that the EO was being reviewed for potential update by the White House, as it has been by all administrations since 1994. A very preliminary draft version of a revised EO was circulated among agencies this past summer and, unfortunately, was leaked to the press. This leak fueled unfounded and uninformed speculation that the draft revision constituted a significant and unprecedented departure from EO 11988. Since that time, many professionals, including senior U.S. Army Corps of Engineers staff, academic policy experts, and the Association of State Floodplain Managers all have reported that the unofficial draft update was substantially consistent with EO 11988 and with the supporting guidance that was adopted by each agency after the 1977 EO was issued. In light of the misinformation circulating regarding the EO, this document attempts to correct that misinformation and articulate the need for an updated EO on floodplain management.

What is an Executive Order?

A federal Executive Order is simply direction from the Office of the President to Executive Branch agencies that focuses or otherwise clarifies the directed agencies' missions with respect to a given topic. Executive Orders are similar to directives one might see from the Office of the Governor, Mayor, Chief Executive Officer, or other executive in any government organization. Executive Orders are usually directed to Executive Branch agencies to help guide the operations of the federal government. When issuing Executive Orders, presidents may cite the specific law under which they have authority to act. Federal Executive Orders tend to be continued from one administration to the next, as has been the case with EO 11988.

Why is an update to the 1977 Executive Order important?

- The need for a revision was first pointed out in the 1994 Interagency Report on the Midwest Flood of 1993, *Sharing the Challenge*. It identified federal and federally sponsored facilities that sustained flood damage and indicated that these facilities, including critical infrastructure, remained at risk. Further, it identified



the need for assessing the vulnerability of existing federal facilities to reduce the possibility of major losses.

- Flood damage in the United States continues to escalate as evidenced by Hurricanes Katrina, Rita, and Ike, and recent riverine flooding in the Midwest and upper Midwest. The vulnerability of floodplain inhabitants and their property persists, federal taxpayer expenditures for disaster relief and recovery continue to grow, and the natural functions of floodplains continue to deteriorate. Post-flood disaster assessments and concerns about recent development in floodplains have provided evidence of continued federal shortcomings in complying with the EO—that is, federal agencies have been locating or supporting development in floodplains. An updated EO would be based on over 30 years of implementation of the existing EO and would incorporate both lessons learned and best practices.
- An updated EO would clarify many issues that have arisen since 1977, such as the importance of critical facilities to public safety and community resilience, and requiring agencies to be consistent with the requirements of state, tribal, and local laws and ordinances concerning floodplain management and hazard mitigation.
- An updated EO, built upon EO 11988, would reaffirm the federal commitment to floodplain management and raise awareness with federal agencies about the need to reduce flood damage.

Issuing an updated EO would give the President and the Administration an opportunity not only to show federal leadership on floodplain management but also to take a significant step toward reducing potential flood damage, loss of life, and loss of natural floodplain resources and functions. In addition, a new EO would allow the President and the Administration to put emphasis on dealing with this important challenge at a time when escalating flood losses add to the federal deficit. An updated EO can also help prepare the nation to adapt to changing climatic conditions. Finally, through an updated EO, the President could take note of the important environmental benefits that natural floodplains provide and to emphasize the need to avoid using federal taxpayer funds to destroy these valuable resources.

Rumors Associated with Leaked Executive Order

During the summer of 2009, various organizations became alarmed by what they incorrectly perceived as a significant expansion of EO 11988. The following list attempts to capture and respond to the more widely circulated misconceptions.

Myth: The leaked draft was longer and hence must be a significant expansion in Executive direction.

Reality: *The draft covered substantive areas addressed in EO 11988 and associated guidance that had been issued as part of its implementation. The most notable and significant changes were to recognize climate change among the many federal considerations when using taxpayer dollars to build or support activities in floodplains, and to require an inventory of federal critical facilities.*



Myth: The leaked draft introduced a new topic of critical facilities and tied these to the 500-year floodplain.

Reality: *Critical facilities tied to the 500-year flood were part of EO 11988 and its guidance, and pertain to critical facilities funded with federal taxpayer dollars. In federal and state funding for critical facilities, some states have been using the original EO 11988 guidance for years as it applies to critical facilities, in determining what to fund and what safeguards need to be built into the siting, design, and construction of such facilities.*

Myth: The leaked draft Executive Order would violate the U.S. Constitution by imposing new requirements on states and local governments.

Reality: *As noted above, the draft EO carried forward requirements of EO 11988 and associated guidance issued by federal agencies more than 30 years ago. If a new EO is issued on floodplain management under statutory authority, it will have to be in conformity with enabling statutes. In issuing an EO, the President cannot exceed the powers granted by the Constitution and Congress. Executive orders have no effect as law in the absence of constitutional or congressional authorization.*

Myth: The leaked Executive Order was broadened to include waters versus floodplain lands.

Reality: *The use of the word “waters” is factually correct and consistent with the intent of Congress in enacting the laws referenced in EO 11988 (the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.), the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 et seq.), and the Flood Disaster Protection Act of 1973 (42 U.S.C. 4001 et seq.)).*

Would an updated EO prohibit development in the floodplain?

The draft does not prohibit federal investments or activities in floodplains, but it does create a consistent policy for evaluating such development to ensure that the federal government is not contributing to the loss of life and property and to the loss of the natural values that floodplains provide.

Will agencies be required revise or adopt new regulations or procedures to implement the new EO?

Agencies likely will issue or amend existing regulations and procedures as needed within one year of the date of the new EO. This is standard procedure.

Next Steps

We understand that the administration will work on an updated Executive Order, with the intent of renewing a focus on long-standing federal policy while also introducing timely updates, such as considerations for climate change. Although there is no official comment process or period, we understand that senior staff at the US Army Corps of Engineers and the Federal Emergency Management Agency has been identified to receive informal comments regarding the existing EO 11988 to help inform development of an updated Executive Order. For more information on this topic, please contact Larry Larson, ASFPM, at Larry@floods.org.



**Wisconsin Association for
Floodplain, Stormwater and Coastal Management
(WAFSCM)**

Membership Application/Renewal Form

For January 2010 – December 2010

Membership Fee: \$20.00

Name:			
Title:			
Organization:			
Address:			
City:	State:	Zip Code:	
Phone:	Ext.:	Fax:	
E-mail:			
Would you like to receive occasional announcements, newsletters and/or notices via E-mail: Yes No			
Other Affiliations:			
Primary Interest:	Floodplain	Stormwater	Coastal
Specific Interest:			

Please include a check for the annual Membership Fee of \$20.00 made payable to WAFSCM

Return to: Carrie Bristol-Groll, PE, CFM
WAFSCM
c/o Stormwater Solutions Engineering, LLC
100 East Sumner Street
Hartford, WI 53027

If you have questions, call Carrie Bristol-Groll at (262) 673-9697 or cbg@stormwater-solutions-engineering.com.