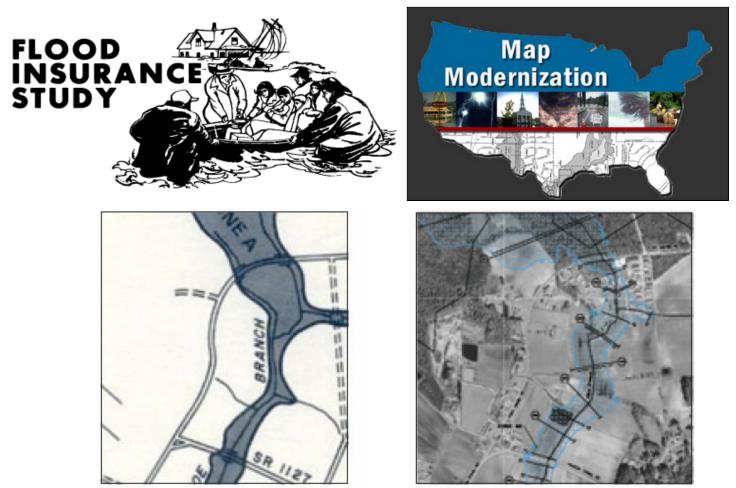
HH&C Community of Practice Tri-Service Infrastructure Conference 2-5 August 2005 - St. Louis

## Corps Involvement in FEMA's Map Modernization Program

Kate White, PhD, PE (CEERD-RN) John Hunter, PE (CELRN) Mark Flick (CELRN)

### **FEMA Map Modernization Program**



Paper flood map section

Digital flood map section



US Army Corps of Engineers

## **FEMA Map Modernization Program**

- >90K Flood Insurance Rate Map panels
- ~70% FIRM > 10 years old by 2005
- GAO recommended FEMA align funding to flood risk
- MMP details in Multi-year flood Hazard Identification Plan (MHIP) - living document
  - Studies for > 1/3 of counties started by FY05
  - ~ 40% of population will have digital maps by FY05
  - MHIP FY02-05  $\rightarrow$  08 with completion by FY10
  - FY05-09 sequence for DFIRM production
  - Dynamic scheduling for projects scheduled through FY08 (completion through FY10)
  - Risk-based method to establish appropriate level of detail, accuracy, and analysis for reliable maps



US Army Corps of Engineers

## **Current MHIP**

Region	FY04 Funding <sup>1</sup>	FY05 Funding <sup>1</sup>	FY06 Funding <sup>2</sup>	FY07 Funding <sup>2</sup>	FY08 Funding <sup>2</sup>	
1	\$4,206,000	\$5,315,000	\$5,661,000	\$5,827,500	\$5,827,500	
2	\$9,420,000	\$11,475,000	\$12,087,000	\$12,442,500	\$12,442,500	
3	\$9,752,000	\$12,047,000	\$12,852,000	\$13,230,000	\$13,230,000	
4	\$35,722,000	\$35,725,000	\$38,097,000	\$39,217,500	\$39,217,500	
5	\$12,798,000	\$17,222,000	\$18,207,000	\$18,742,500	\$18,742,500	
6	\$17,583,000	\$23,159,000	\$26,775,000	\$27,562,500	\$27,562,500	
7	\$7,411,000	\$10,115,000	\$10,710,000	\$11,025,000	\$11,025,000	
8	\$5,432,000	\$6,908,000	\$7,191,000	\$7,402,500	\$7,402,500	
9	\$11,462,000	\$13,517,000	\$15,453,000	\$15,907,500	\$15,907,500	
10	\$4,572,000	\$5,849,000	\$5,967,000	\$6,142,500	\$6,142,500	
Total	\$118,358,000	\$141,332,000	\$153,000,000	\$157,500,000	\$157,500,000	

#### Table ES-2. Map Production Funding Distribution by Region, FY04-FY08

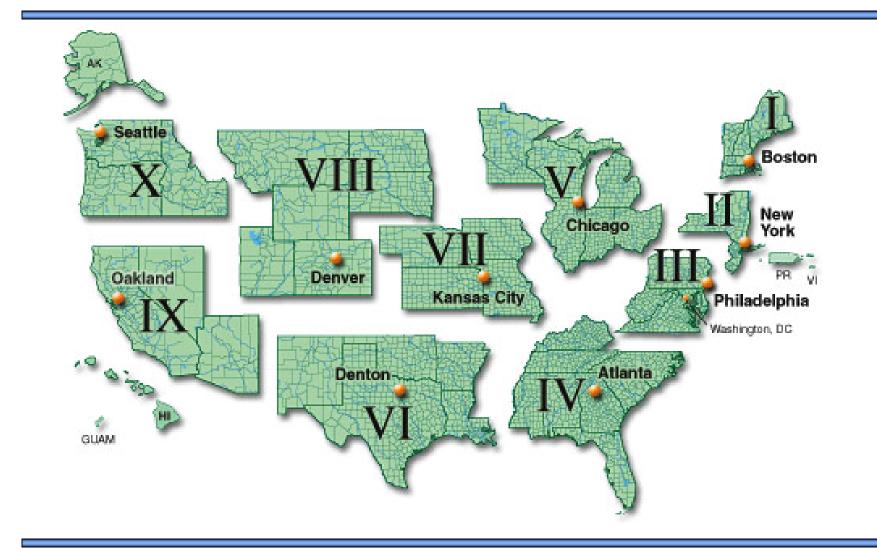
Notes: 1 - Actual

2 - Proposed



US Army Corps of Engineers

## **FEMA Regions**





US Army Corps of Engineers

# **Corps Support to FEMA**

- The US Army Corps of Engineers has played a vital role in the development of Flood Insurance Studies for the FEMA since the 1970's
- Local Corps Districts
  - Local knowledge of rivers, flooding, development patterns, regulatory permits, updated hydrology, bridges
- National Corps Districts
  - Experience with latest methods, use  $\beta$  version of HEC and CHL models first
  - One Door to the Corps enables flexible and time-sensitive scheduling



US Army Corps of Engineers

# **Corps Support to FEMA**

- Corps Centers
  - Hydrologic Engineering Center
    - Develops the HEC-RAS, GeoHEC-RAS, HMS, GeoHMS, and flood frequency analysis models used by Districts and others
  - Remote Sensing/GIS Center of Expertise
    - Develops local, regional, and national geospatial databases and supports Corps AIS for Emergency Management, O&M, and regulatory (in process)

- Corps Laboratories
  - Coastal and Hydraulics Laboratory
    - Develops the coastal models for local and regional wave and surge modeling (STWAVE, ADCIRC, WISWAVE)
    - Has access to LIDAR bathymetry, soundings, and other data collected for coastal studies
  - Cold Regions Research and Engineering Laboratory
    - Supports HEC in snowmelt and ice jam code for models
    - Develops geospatially enabled local and regional hydrology



US Army Corps of Engineers

# **Corps Support for FEMA**

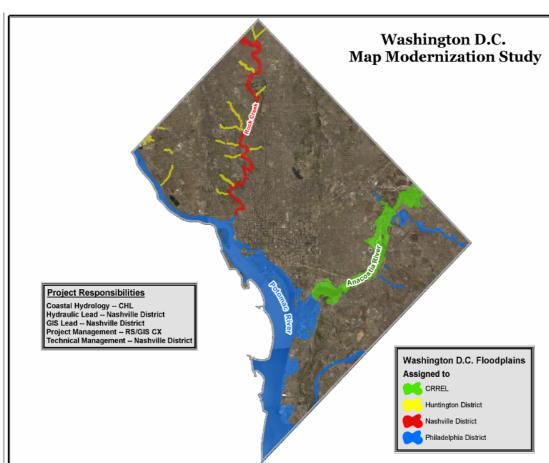
- Regional Efforts Developing
  - National PDT (RS/GIS CX)
  - Gulf Coast (CEMVN)
  - Upper Mississippi (CEMVR)
  - Policy and Corporate Issues (IWR)
  - Hydrologic Studies (HQUSACE)
  - National-level MOU (HQUSACE)
- Corps expertise in the watersheds brings unique perspective to FEMA partners
  - Evaluating level of detail required for updates
  - Leveraging updates with other floodplain management outcomes (e.g. cumulative impacts)



US Army Corps of Engineers

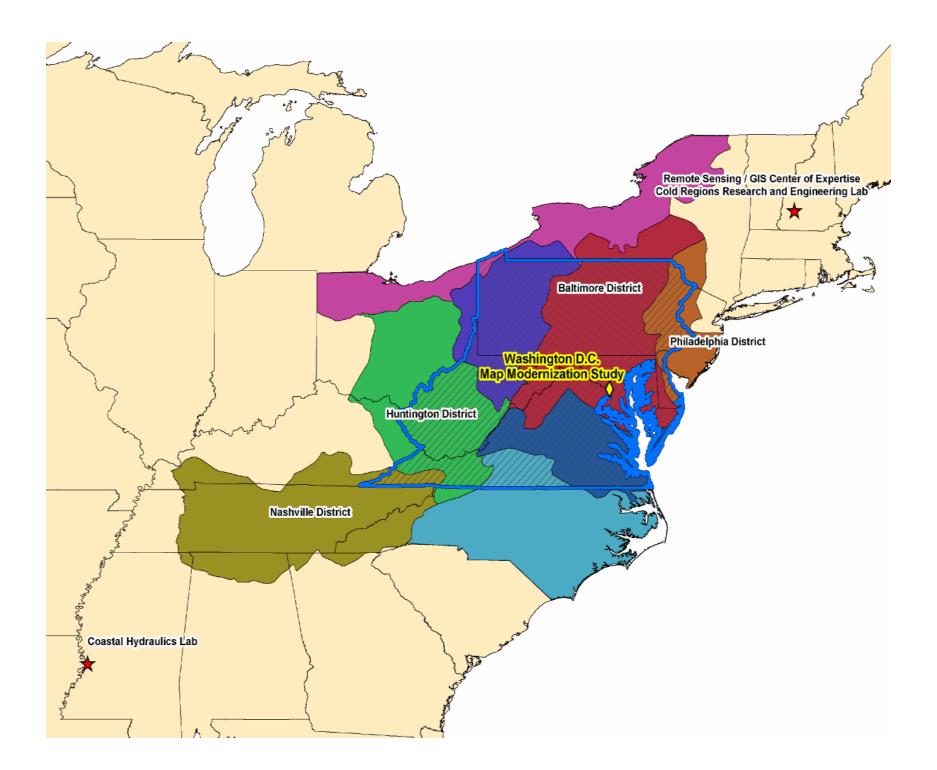
## **National FEMA PDT**

- Formed to work with FEMA Region 3
  - One Door to the Corps
- First project: Washington DC
  - 4 Districts (NAB, NAP, LRH, LRN)
  - 2 labs (ERDC CHL and CRREL)
  - Developed bridge data collection format
  - Leveraged development of approximate study method





US Army Corps of Engineers



## **National FEMA PDT**

- Networking:
  - National PDT spreadsheet (NAB, NAE, NAO, NAP, LRB, LRH, LRN, MVN, MVP, MVS, NWS, NWP, SPA, ERDC, HEC)
  - Experience with Coastal, GIS, H&H, and PM aspects
- Capacity Building DFIRM Tools Training
  - Facilitated 3-day virtual training session for Corps, USGS, Michael Baker, contractors
- Next Project:
  - Coastal surge analysis for Chesapeake Bay
    - 2 Districts (NAB, NAP)
    - 1 lab (ERDC CHL)
  - Chesapeake Bay interagency workshop to maximize use and leveraging of map updates
- More to come.....



- Base Mapping
  - 1m contours for DC area (minus blackout areas)
  - Planimetrics (vector data for roads, etc)
  - Aerial photography (incorporated special DC dataset, except blackout areas)
- Manipulation
  - Vertical datum adjustments
  - Combining DEMS created from higher resolution data inside DC with DEMS created from other data outside to capture watershed areas





Hydraulics, Hydrology, and Coastal Community of Practice



US Army Corps of Engineers

- Hydrology
  - FIS provides very little data (e.g., skews)
  - Updated gage analyses
  - Verified Q's

20,000

10,000

5,000

1.000

500

200

0.1

100-year Discharge (cfs)

- Performed uncertainty analysis
- Investigated flood history

District of Columbia streams Watts Branch updated gage analysis

Watts Branch FIS

Prince George's County, MD streams

0.5

1

Drainage Area (sq mi.)

5

10

50

0

🖾 HMS * Sum	mary of R	Results for Subbasi 🗐 🗆 🔀				
Project: Piney10	Run Name	e: Run 2 Subbasin: R830W130 💌				
		r050600 Basin Model: Piney				
End of Run : 16Apr050600 Met. Model : 100-Year Execution Time :03Feb051047 Control Specs : 100-yr 1hr						
EXEC		its: Inches C Acre-Feet				
Computed Results –	volume Unit	IS: 1º mones 1 Acrement				
· ·	4049.9 (cfs)	Date/Time of Peak Discharge : 15 Apr 05 1400				
Total Precipitation :	IPrecipitation: 8.26 (in) Total Direct Runoff: 5.94 (in)					
Total Loss :	es : 2.28 (in) Total Baseflow : 0.00 (in)					
Total Excess :	5.98 (in)	Total Discharge : 5.94 (in)				
	Print	Close				
	IS 70 gage 1992-2002 .5 confidence limit 95 confidence limit					
1,000	5	1 0.5 0.2 Exceedance Probability (%)				

US Army Corps of Engineers

#### • Hydraulics

- Hard copy scans of HEC-2 output
- Scan and digitize data
- Update HEC2 to HEC-RAS
- Develop automated inundation areas for approximate studies using GeoHEC-RAS
- Bridge data/NPS/quick surveys/tied to GIS database

Photo below shows the downstream face of the Normanstone Drive - Bridge #3 over the Creek along Normanstone Drive.





US Army Corps of Engineers

					and a second	1.440	\$300.000	\$.250	\$390.000	5.000	5455.000
			machine and and	1000002-007-00	CONTRACTOR OF THE OWNER OF THE	10.000	0.0	0.0	0.0	0.0	0.0
		ALC: PATER	2014 - 1 C. 201	100 100 100 100 100	6.300	4600.000	0.030	\$390.000	0.045	5570.060	0.090
alaay i	ianu 1		1000		6.040	0.0	0.0	6.0	0.0	0.0	0.0
10 Aut	199 <b>1</b> - 1	288875 A. 10	1996.0	0.0							
6200 B	N 27										
	10.00	all the second second	38.000	4465.000	5570.000	660.000	600.000	600.000	0.0	0.0	0.0
11033	1000	10:000	0.0	0.0	0.0	25.000	4420.000	20.000	4445.000	15.000	4465.000
N 1924	S	30.000	4220.000	30.000	4405.000	-0.090	4600.000	-6.790	4640.000	-1.190	4660.000
W3 **	22	5.000	4545.000	-2-190	4766.000	-2.090	4720.000	-2.940	4730.000	-3-650	4770.000
	6.00	-4.190	4400-000	-5.190	4830.000	-6.090	4870.000	-16.000	4890.000	-6.940	4910.000
	6R	-7.590	4940.000	-7.040	5000.000	-8.290	5048.000	-9-140	5152.000	-8.690	\$162.000
	ĉ.	-9.190	5171.000	-10.500	5285,000	-10,900	5295.000	-8.090	5323.000	-5-690	\$333.000
	6.	-1.600	5361.000	-0.950	5376.000	-1.900	5390.000	4.330	5390.000	5.040	5460.000
	64	10.000	5570.000	10.000	5700.000	45.000	5800.000	6.0	0.0	0.0	0.0
	544	0.900	1.600	2.560	6.0	550.000	80.000	34006.000	6.060	-10.600	-10.000
	**	0.100	0.0	0.0	c.o	75.000	75.000	75.000	0.0	0.130	0.0
	K2	0.0	0.0	1.000	33.500	36.000	0.0	6.0	0.0	0.0	0.0
	13	10.000	0.0	0.0	0.0	0.0	0.0	0.0	38.000	38.000	0.0
	11	4.000	4370.000	36.000	6.0	5000.000	46.700	0.0	5580.000	44.000	0.0
	61	6290.000	45.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	NH	6.000	0.055	4385.000	6-040	4640.000	0.030	5360-000	0.045	5560.000	0.080
	NH.	5685.000	0.060	6150.000	e.o	0.0	0.0	6.0	0.0	0.0	0.0
	11	8.000	48.000	4640.000	5360.000	215.600	780.000	490.000	0.0	0.0	0.0
	68	35.000	4055.000	30.000	4095.000	25.600	4145.000	25.000	4330.000	20.000	4335.000
	6.k	15.000	4350.000	10.000	4385.000	5.000	4015.000	4.000	4640.000	-3.610	4640.000
	6R	-5.210	4650.000	-4.810	4680.000	-6.000	4700.000	-9.310	4730.000	-11.900	4770.000
	6H	-9.110	4650.000	-7.900	4910.000	-7.700	4990.000	-7.400	5000.000	-7.300	5010.000
	64	-7.200	5070.000	-7.400	508C.000	-7.100	5090.000	-7.360	5100.000	-7.100	5110.000
	6K		5120.000	-6.900	5166.000	-7.100	5170.000	-4.800	5180.000	-0.700	5220.000
	6 K	-7.200	5240.000	-0+860	5250.000	-6.800	5270.000	-5.300	5310.000	-3.800	5350.000
	68	-2.300	5360.000	4.000	5366.000	5.000	5415.000	13,000	5500.000	13.000	5560.000
	68	10.000	9660.000	15.000	5076.000	20.000	5685.000	25.000	5880.000	20.000	5950.000
	64		6000.000	25+000	6120.000	30.000	6150.000	6.0	0.0	0.0	0.0
	AL.	0.0	0.0	0.0	4.100	0.300	0.0	0.0	0.0	0.0	0.0
	***	5.000		4600.060	6.065	4670,000	0.030	5330.000	0.045	5415.060	0.090
	N 84	6055.000	0.0	0.0	6.0	0.0	0.0	6.0	0.0	0.0	0.0
	**	7.000	45.000	4670.000	5330.000	1206.000	1200.000	1200-000	0.0	0.0	0.0
	64	20.000	3730.000	15.000	4255.000	11.000	4600.000	11.000	4620.000	10.060	4640.000
	6.8		4455.000	3.100	4076.000	1.750	4670.000	=2.000	4680.000	-4.750	4710.000
	68		4730,000	-9.400	4766.000	-14,900	4820.000	-15.500	4830.000	-18.900	4840.000
	6H		4850.000	-19.400	4916.000	-15.200	4940.000	-14.000	4980.000	-13.060	5060.000
	68		5020.000	-12.000	5636.006	-11,000	5060.000	-10.600	5110.000	-10.060	5120.000
	68		5130.000	-9.400	5146.000	-9.200	5150.000	-6.600	5200.000	-5.100	5220.000
	6.8		5270.000	-3.260	5296.000	-2.450	5330.000	3.100	5330.000	5.060	9390.000
	6.8	10.600	5415.000	13.270	5936.000	10.000	5450.000	5.000	5465.000	5.000	5465.000
	4.4	10.000	5495.000	15,000	5526.000	15,000	5705.000	20.000	5808.000	25.000	6055.000
	AC.	0.650	0.050	0.030	6.300	0.500	0.0	0.0	0.0	0.0	6.0
	*1	6.500	\$3.000	4663.000	5396.000	490.000	490.000	490.000	0.0	0.0	0.0
	33	10.600	0.0	9.0	6.0	0.0	0.0	6+0	10.000	10,000	0.0
	64		4000.000	13.300	9235.000	10.000	\$653.000	5.000	\$663.000	3,100	46 10 .000
	68.		9670.000	-0.200	9000. Jaa	-3.740	4710.000	-3.960	4730.000	-0.360	4780.000
	GR		91120.000	-14.580	483L.000	-17.900	4660.000	-18.430	4890.000	-10.300	4910.000
	6.14	=19.200	9960.000	-13.000	69aC.060	-12.000	5000.000	-11.680	5020.060	-12.000	5030.000
	22	1	F 8 / 8 0 5 5	0.100	# 11.F ACR		F130 000	0.000	FRIDE CONT		E140 000

The following sketch provides general dimensions and elevation data for the Normanstone Drive - Bridge #3 on the Creek along Normanstone Drive - Bridge #3 O - 94.72O - 94.72O - 85.6215'

Elevation at (2) was taken

of second shelf

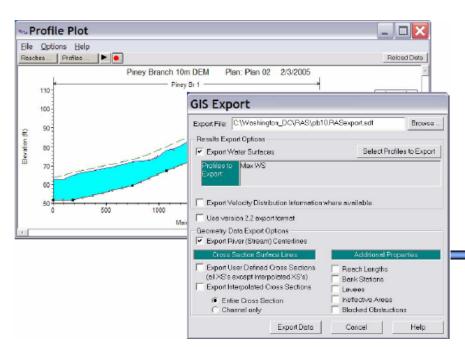
Hydrology, and Coastal Community of Practice

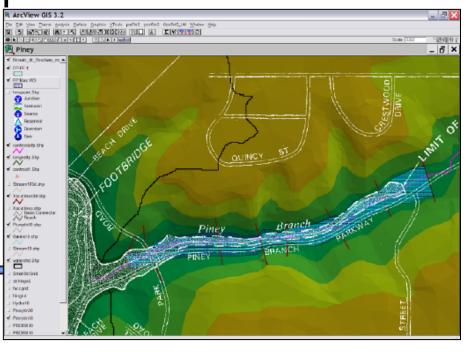
#### DFIRM Database and Map Graphics

- Old = paper
- New = digital, meets FEMA stds
- FIS
  - Old: basic, little information
  - New: Complete text description

The software products that are needed to perform procedures outlined below are as follows:

- ArcMap 8.3
- Spatial Analyst for ArcMap 8.3
- 3D Analyst for ArcMap 8.3
- EZ GeoWizards for ArcMap 8.3
- Xtools for ArcMap 8.3
- ArcView 3.X
- Spatial Analyst for ArcView 3.X
- 3D Analyst for ArcView 3.X
   Xtools for ArcView 3 X
- Xtools for ArcView 3.X
- GeoHMS for ArcView 3.X
  GeoRAS for ArcView 3.X
- GeoRAS for ArcViev
   MrSid Extension





## **Lessons Learned**

- P2 structure for project management not necessarily optimal for financial management
- Bridges, bridges, bridges!
- National PDT is great example of 2012 in action:
  - Grassroots efforts lead to interested, energetic participants
  - Cross-District and cross-Division partnering enhanced
- Other efforts aligned with regional business center approach
- Thanks to:
  - GIS Lead: Mark Flick, LRN
  - Hydraulics Lead: John Hunter, LRN
  - Jerry Webb: HQUSACE support and encouragement

