ENGINEERING PERFECTION

781 Echo Road
South Charleston, WV 25303
304 545 3033
FAX 304 744 5755
jerry@engineeringperfection.net

April 18, 2012

Division of Administration
Purchasing Division
Building 15
2019 Washington Street, East
P.O. Box 50130
Charleston, WV 25305-0360

Re: Expression of Interest; Req# HSE01232 HAZUS MH Analysis Phase II

This Expression of Interest is in response to your Request for Quotation number HSE01232. The request references Architect and Engineering Consulting. The scope is for the state-wide analysis of flood risk, utilizing the program HAZUS MH version 2.1. In addition to the scope prescribed in the RFQ, several options are included in this proposal.

This Expression of Interest is submitted by Engineering Perfection, PLLC as the prime contractor. Engineering Perfection, PLLC is registered with the West Virginia Department of Administration. Our vendor number is A30145329. Teaming with Engineering Perfection on this project will be URS Corporation, as subcontractor.

We strongly believe that our team has unique qualifications to perform this work, with a strong sense of the needs of West Virginia, unmatched technical skills in the application of HAZUS, and efficiency in project execution.

Thank you for this opportunity to propose services for the West Virginia Division of Homeland Security and Emergency Management.

Very truly yours,

S. G. (Jerry) Gilbert, P.E., DEE, CFM
Engineering Perfection, PLLC

Enclosure: Expression of Interest

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
HSE01232	2

ADDRESS CORRESPONDENCE TO ATTENTION OF:
TARA LYLE
304-558-2544

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE
Engineering Perfection, PLLC
781 Echo Road
South Charleston, WV
25303

SHIP TO
HOMELAND SECURITY & EMERGENCY
MANAGEMENT, DIVISION OF
BUILDING 1, ROOM EB80
1900 KANAWHA BOULEVARD, EAST
CHARLESTON, WV
25305-0360 304-558-5380

DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/09/2012				

BID OPENING DATE: 04/03/2012 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

DEADLINE FOR ALL TECHNICAL QUESTIONS IS 03/23/2012 AT THE CLOSE OF BUSINESS. ANY TECHNICAL QUESTIONS RECEIVED WILL BE ANSWERED BY FORMAL ADDENDUM ISSUED BY THE PURCHASING DIVISION AFTER THE DEADLINE HAS LAPSED.

NOTICE

A SIGNED BID MUST BE SUBMITTED TO:

DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
BUILDING 15
2019 WASHINGTON STREET, EAST
CHARLESTON, WV 25305-0130

THE BID SHOULD CONTAIN THIS INFORMATION ON THE FACE OF THE ENVELOPE OR THE BID MAY NOT BE CONSIDERED:

SEALED BID

BUYER:----------TL/32----------

RFQ. NO.:----------HSE01232----------

BID OPENING DATE:------04/03/2012----------

BID OPENING TIME:------1:30 PM----------

PLEASE PROVIDE A FAX NUMBER IN CASE IT IS NECESSARY

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE [signature] TELEPHONE 304 545-3033 DATE April 18, 2012

TITLE Owner, Member FEIN 26-0085788 ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

State of West Virginia
Department of Administration
Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

Request for Quotation

RFQ NUMBER	PAGE
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ADDRESS CORRESPONDENCE TO ATTENTION OF:
TARA LYLE
304-558-2544

VENDOR
RFQ COPY
TYPE NAME/ADDRESS HERE
Engineering Perfection
781 Echo Road
South Charleston, WV
25303

SHIP TO
HOMELAND SECURITY & EMERGENCY
MANAGEMENT, DIVISION OF
BUILDING 1, ROOM EB80
1900 KANAWHA BOULEVARD, EAST
CHARLESTON, WV
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DATE PRINTED	TERMS OF SALE	SHIP VIA	F.O.B.	FREIGHT TERMS
03/09/2012				

BID OPENING DATE: 04/03/2012 BID OPENING TIME 01:30PM

LINE	QUANTITY	UOP	CAT. NO.	ITEM NUMBER	UNIT PRICE	AMOUNT

TO CONTACT YOU REGARDING YOUR BID;
jerry@engineeringperfection.net

CONTACT PERSON (PLEASE PRINT CLEARLY):
Scubrd Gilbert

****** THIS IS THE END OF RFQ HSE01232 ****** TOTAL:

SEE REVERSE SIDE FOR TERMS AND CONDITIONS

SIGNATURE	TELEPHONE	DATE
TITLE	FEIN	ADDRESS CHANGES TO BE NOTED ABOVE

WHEN RESPONDING TO RFQ, INSERT NAME AND ADDRESS IN SPACE ABOVE LABELED 'VENDOR'

EXHIBIT 10

REQUISITION NO.: HSE01232

ADDENDUM ACKNOWLEDGEMENT

I HEREBY ACKNOWLEDGE RECEIPT OF THE FOLLOWING CHECKED ADDENDUM(S) AND HAVE MADE THE NECESSARY REVISIONS TO MY PROPOSAL, PLANS AND/OR SPECIFICATION, ETC.

ADDENDUM NO.'S:

NO. 1 Addendum No. 1 Dated March 29, moving bid opening date to April 12

NO. 2 Addendum No. 2 Dated April 4, with Q &A entitled "Addendum No. 1" and moving bid opening date to April 18

NO. 3 .....

NO. 4 .....

NO. 5 .....

I UNDERSTAND THAT FAILURE TO CONFIRM THE RECEIPT OF THE ADDENDUM(S) MAY BE CAUSE FOR REJECTION OF BIDS. VENDOR MUST CLEARLY UNDERSTAND THAT ANY VERBAL REPRESENTATION MADE OR ASSUMED TO BE MADE DURING ANY ORAL DISCUSSION HELD BETWEEN VENDOR'S REPRESENTATIVES AND ANY STATE PERSONNEL IS NOT BINDING. ONLY THE INFORMATION ISSUED IN WRITING AND ADDED TO THE SPECIFICATIONS BY AN OFFICIAL ADDENDUM IS BINDING.

.....
SIGNATURE

Engineering Perfection, PLLC
.....
COMPANY

April 18, 2012
.....
DATE

REV. 11/96

RFQ No. HSE01232

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

West Virginia Code §5A-3-10a states: No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owed is an amount greater than one thousand dollars in the aggregate.

DEFINITIONS:
"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Debtor" means any individual, corporation, partnership, association, limited liability company or any other form or business association owing a debt to the state or any of its political subdivisions. "Political subdivision" means any county commission; municipality; county board of education; any instrumentality established by a county or municipality; any separate corporation or instrumentality established by one or more counties or municipalities, as permitted by law; or any public body charged by law with the performance of a government function or whose jurisdiction is coextensive with one or more counties or municipalities. "Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

EXCEPTION: The prohibition of this section does not apply where a vendor has contested any tax administered pursuant to chapter eleven of this code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

Under penalty of law for false swearing (***West Virginia Code*** §61-5-3), it is hereby certified that the vendor affirms and acknowledges the information in this affidavit and is in compliance with the requirements as stated.

WITNESS THE FOLLOWING SIGNATURE

Vendor's Name: Engineering Perfection, PLLC

Authorized Signature: _____ Date: April 16, 2012

State of WV

County of Kanawha, to-wit:

Taken, subscribed, and sworn to before me this 16 day of April, 2012.

My Commission expires Sept 20, 2014.

AFFIX SEAL HERE

NOTARY PUBLIC _____

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
ROBERT A. JONES
1106 Fledderjohn Rd.
Charleston, WV 25314
My Commission Expires Sept. 20, 2014

Rev. 09/08

State of West Virginia
VENDOR PREFERENCE CERTIFICATE

Certification and application* is hereby made for Preference in accordance with ***West Virginia Code***, §5A-3-37. (Does not apply to construction contracts). ***West Virginia Code***, §5A-3-37, provides an opportunity for qualifying vendors to request (at the time of bid) preference for their residency status. Such preference is an evaluation method only and will be applied only to the cost bid in accordance with the ***West Virginia Code***. This certificate for application is to be used to request such preference. The Purchasing Division will make the determination of the Resident Vendor Preference, if applicable.

1. **Application is made for 2.5% resident vendor preference for the reason checked:**

___ Bidder is an individual resident vendor and has resided continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

✔ Bidder is a partnership, association or corporation resident vendor and has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; or 80% of the ownership interest of Bidder is held by another individual, partnership, association or corporation resident vendor who has maintained its headquarters or principal place of business continuously in West Virginia for four (4) years immediately preceding the date of this certification; **or,**

___ Bidder is a nonresident vendor which has an affiliate or subsidiary which employs a minimum of one hundred state residents and which has maintained its headquarters or principal place of business within West Virginia continuously for the four (4) years immediately preceding the date of this certification; **or,**

2. **Application is made for 2.5% resident vendor preference for the reason checked:**

___ Bidder is a resident vendor who certifies that, during the life of the contract, on average at least 75% of the employees working on the project being bid are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

3. **Application is made for 2.5% resident vendor preference for the reason checked:**

___ Bidder is a nonresident vendor employing a minimum of one hundred state residents or is a nonresident vendor with an affiliate or subsidiary which maintains its headquarters or principal place of business within West Virginia employing a minimum of one hundred state residents who certifies that, during the life of the contract, on average at least 75% of the employees or Bidder's affiliate's or subsidiary's employees are residents of West Virginia who have resided in the state continuously for the two years immediately preceding submission of this bid; **or,**

4. **Application is made for 5% resident vendor preference for the reason checked:**

___ Bidder meets either the requirement of both subdivisions (1) and (2) or subdivision (1) and (3) as stated above; **or,**

5. **Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:**

___ Bidder is an individual resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard and has resided in West Virginia continuously for the four years immediately preceding the date on which the bid is submitted; **or,**

6. **Application is made for 3.5% resident vendor preference who is a veteran for the reason checked:**

___ Bidder is a resident vendor who is a veteran of the United States armed forces, the reserves or the National Guard, if, for purposes of producing or distributing the commodities or completing the project which is the subject of the vendor's bid and continuously over the entire term of the project, on average at least seventy-five percent of the vendor's employees are residents of West Virginia who have resided in the state continuously for the two immediately preceding years.

Bidder understands if the Secretary of Revenue determines that a Bidder receiving preference has failed to continue to meet the requirements for such preference, the Secretary may order the Director of Purchasing to: (a) reject the bid; or (b) assess a penalty against such Bidder in an amount not to exceed 5% of the bid amount and that such penalty will be paid to the contracting agency or deducted from any unpaid balance on the contract or purchase order.

By submission of this certificate, Bidder agrees to disclose any reasonably requested information to the Purchasing Division and authorizes the Department of Revenue to disclose to the Director of Purchasing appropriate information verifying that Bidder has paid the required business taxes, provided that such information does not contain the amounts of taxes paid nor any other information deemed by the Tax Commissioner to be confidential.

Under penalty of law for false swearing (West Virginia Code, §61-5-3), Bidder hereby certifies that this certificate is true and accurate in all respects; and that if a contract is issued to Bidder and if anything contained within this certificate changes during the term of the contract, Bidder will notify the Purchasing Division in writing immediately.

Bidder: Engineering Perfection, PLLC **Signed:** _____

Date: April 16, 2012 **Title:** Member, Engineering Perfection

**Check any combination of preference consideration(s) indicated above, which you are entitled to receive.*

Expression of Interest

Buyer TL/32
Tara Lyle – 304 558 2544
RFQ. No.: HSE01232
Bid Opening Date: April 18, 2012
Hazus MH Analysis Phase II

Submitted by:
Engineering Perfection, PLLC
781 Echo Road
South Charleston, West Virginia 25303
304.545.3033

Teaming with:
URS Corporation
12420 Milestone Center Drive, Suite 150
Germantown, MD 20876

Authorized Contact Person:
Seward G. Gilbert, PE, DEE, CFM, Owner
Engineering Perfection, PLLC

Seward G. Gilbert

April 18, 2012

Date

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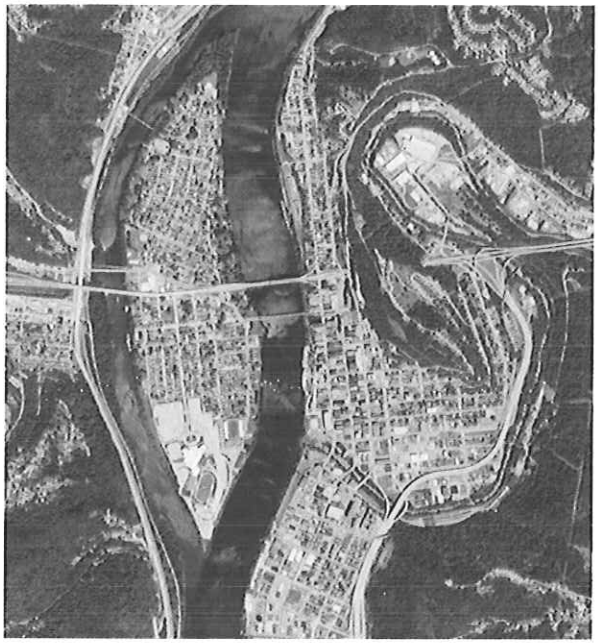
Appendices

Executive Summary

This proposal is in response to the Request for Proposal HSE01232 issued on March 9, 2012 with amendments issued on March 29 and April 4, 2012. The proposal was issued by the West Virginia Department of Homeland Security and Emergency Management, through the Department of Administration.

Engineering Perfection, teaming with URS Corporation, is ideally suited to evaluate the State of West Virginia for flood risk using the FEMA's Hazus model. The team is familiar with West Virginia regulatory programs and has a great depth of understanding of the Hazus model. We have the resources to perform the work, the creativity to communicate clearly, and the resources to complete the project quickly and efficiently.

Our approach will be to listen to the state staff to understand their needs and desires. After expectations are clearly defined, we will prepare a sample of the final work product to ensure that it meets the state's requirements and needs. If our team or the state identifies needed improvements to the final work product during this evaluation, our team will work with West Virginia procurement and professional staff to determine if the identified improvement(s) should be incorporated into the final work product.



The entirety of Wheeling Island is within the 100 year floodplain. Some parts of the island will be under more than 10 feet of water during this event. Affected facilities include the casino, racetrack, stadium, fire station and community shelter.

West Virginia flood risks have been analyzed by Hazus to some degree in a Phase I project, submitted by Michael Baker Jr., Inc. in August 2010 using Hazus MR3. However, the 500 year return interval was not included in Phase I, and as a result the model has insufficient data to estimate Average Annualized Losses (AAL). Since its creation, the Hazus model has undergone improvements and continues to be improved. URS has been at the forefront of identifying significant shortcomings in the Hazus analyses performed with prior software versions. While many of these shortcomings have been addressed in the current Hazus 2.1 version, we understand the problems with mixing Hazus results from MR3 and 2.1.

In order to create the most credible results, we propose to re-analyze all of the recurrence intervals. We believe that in addition to creating the 500-year recurrence interval scenarios, the 10-, 25-, 50- and 100-year recurrence interval scenarios must be re-run in the latest version of Hazus to create credible Average Annualized Losses. Mixing computations from older versions of Hazus with those from the newest version creates a significant risk of meaningless or inconsistent results. We believe our approach will provide the state with a risk assessment of

the highest credibility and consistency that will support their desired effect of heightened awareness, increased mitigation of risk, and better preparedness.

This Expression of Interest is intended to fulfill the minimum requirements of the Request For Proposal. The document provides several options for consideration by department staff. Our intent is to offer choices that would result in the most accurate results and the greatest community understanding. Since these options include additional costs, we understand that department staff is in the best position to determine if these options add significant value, and if the resources are available for their inclusion in this project.

Section I: Qualifications of Firm

Engineering Perfection (EP), teaming with URS Corporation (URS), is pleased to provide this proposal in response to HSE01232 issued March 9, 2012} to the West Virginia Department of Homeland Security and Emergency Management (WVDHSEM). Our proposal demonstrates the reasons our team is the best choice for this work:

- **We know West Virginia and know the Hazus model.** EP, located in South Charleston, has a long history of successful work with WVDHSEM. URS is a national leader in developing and using the Hazus model, hazard mitigation planning, and the FEMA floodplain mapping program. The proposed URS Hazus lead for this project is located in southwest Virginia, only 2.5 hours from Charleston.

A number of West Virginia communities are protected by floodwalls. For an accurate risk assessment, the protection and overtopping of the floodwalls must be considered.

- **We will use a proven work plan.** Our work plan will be based on the recently completed *FEMA Hazus Average Annualized Loss (AAL) Study* (2010) performed by URS. We know from the AAL study that there are issues with calculations performed with older versions of Hazus (MR3 and MR4). Therefore, our work plan proposes rerunning all return periods (not just the 500-year) with newest version of the program, Hazus 2.1.
- **Our team has worked together for many years.** EP and URS have successfully worked together on FEMA contracts over the last 6 years. Project leads from both firms have worked together extensively and intensively.
- **We know the low risk, low cost implementation approaches.** As part of the *FEMA Hazus AAL Study (2010)*, URS conducted the analysis for the complete Hazus flood model suite of 5 return periods and annualized for all West Virginia counties. We understand the required level of effort, know the potential issues, and have the quality control tools to efficiently and accurately complete the analyses on schedule and within budget.

- **We understand how Hazus results may be used in the future.** EP understands how Hazus has been used in West Virginia, particularly its use in Hazard Mitigation Plans. URS understands how Hazus is becoming part of FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) floodplain mapping projects, especially in their new non-regulatory products. URS played the lead role in FEMA Headquarter's efforts to integrate Hazus into FEMA's new Risk MAP Flood Risk products. Our proposed work products go beyond the minimum requirements of the RFP. Our products will contain many value-added formats: all of West Virginia's AAL data will be included and all new analyses will be formatted for FEMA's Risk MAP Flood Risk Databases.

EP led the effort to bring together this team to complement their West Virginia experience and knowledge with URS' unmatched knowledge of large-scale Hazus studies and use of Hazus for both hazard planning and Risk MAP applications. The qualifications of our proposed team are described below.

Qualifications - Engineering Perfection

The Project Manager and point of contact for the WVDHSEM will be Seward "Jerry" Gilbert, owner of Engineering Perfection, PLLC, (EP) located in South Charleston.

His firm specializes in flood risk analysis and prevention in the State of West Virginia. The firm was established in 2004, and since its inception has provided flood-related services throughout West Virginia. Relevant projects include providing flood mitigation technical expertise, hydraulic analysis of proposed developments, providing permitting assistance, training, and hydrology and drainage assessment.

References for Work Performed by EP

Mr. David Jackson, L.S.
Jackson Surveying, Inc.
677 West Main Street
Clarksburg, WV 26302
(304) 623-5851

Mr. Alex McLaughlin, Esquire
The Calwell Practice, PLLC
Law and Arts Center West
500 Randolph Street
Charleston, WV 25302
(304) 343-4323

Ms. Melissa Scott
GIS & Local Government Services Project Manager
Anderson & Associates, Inc.
93 Virginia Street
Beckley, WV 25801
(304) 461-0020

Mr. Gilbert is proficient in geographic information systems (GIS) and has experience with the Hazus model.

For example, in 2009, Mr. Gilbert presented an analysis of the benefits and issues for Harrison County, WV[1] at the first statewide conference of floodplain managers. He conducted the study on his own initiative. Robert Perry, then the state NFIP coordinator attendee said it was the most informative presentation of the conference. He has been tracking Hazus developments since that time. Mr. Gilbert is a registered Civil Engineer in West Virginia and is board-certified by the American Academy of Environmental Engineers. Mr. Gilbert has been the principle organizer and chairman of the board of the West Virginia Floodplain Management Association since its inception 3 years ago; this is an indicator of his deep commitment to the understanding and communication of flood risks in West Virginia.

EP has performed services for WVDHSEM, including an analysis of methods for estimating base flood elevations in Zone A conducted in November 2007. In March 2012, EP was placed under contract with WVDHSEM to provide on-line training in flood plain management for community officials throughout West Virginia. A samples of EP's work product is provided in Appendix A.

Qualifications - URS

URS is a leading U.S. federal government contractor and an expert in conducting Hazus runs and using Hazus in all phases of hazard mitigation planning. URS has worked on a variety of contracts for FEMA that have involved Hazus analysis and use of the resulting loss estimates in hazard mitigation plans. URS understands how the role of Hazus modeling is expanding from its use in Hazard Mitigation Plans to its increasing use in the FEMA Risk MAP program.

Houses damaged in Clear Creek, West Virginia Flood

Currently, URS is one of the prime consultant teams under FEMA's Hazard Mitigation Technical Assistance Program (HMTAP). The URS HMTAP team has included EP for the last 6 years. Over the entire 15-year history of the HMTAP contracts, URS has been responsible for managing and staffing almost 1,000 task orders totaling nearly $100 million. Under this contract, URS has reviewed many Hazard Mitigation Plans: 365 local, 15 State (including Enhanced State Plans), 18 State updates, and 7 Tribal. Many of these reviews involved evaluating the use of Hazus to satisfy crosswalk requirements in compliance with the Disaster Mitigation Act of 2000 guidelines set forth in 44 CFR 201.6. In addition to these reviews, URS has also been responsible for preparing 7 State Hazard Mitigation Plans and 38 local Hazard Mitigation Plans. Also under the HMTAP contract, URS developed a series of *Mitigation Planning How-To Guides* (Series Number 386-1 to 9, available at www.fema.gov) that provide detailed guidance on processes for assessing risks, developing community support for mitigation decisions, establishing implementation process, and securing funding for projects. URS knows what it takes to use Hazus to satisfy Hazard Mitigation Plan requirements.

URS also has extensive and continuing experience in conducting Hazus runs under FEMA's Risk MAP Production and Technical Services (PTS) contract. URS is part of the Risk Assessment,

[1] "Harrison County HAZUS Example Results," presented at the first West Virginia Floodplain Management Association meeting, held in Clarksburg, WV, April 2009.

Mapping, and Planning Partners (RAMPP) Risk MAP PTS team that leads Risk MAP efforts for West Virginia and 12 other states in FEMA Regions II, III, and VI. URS led the RAMPP efforts in conducting the *FEMA Hazus AAL Study (2010)* and the follow-up *AAL Usability Studies (2011).* Both AAL studies consisted of conducting county-based Hazus Level 1 runs in Hazus MR4 for 10-square-mile drainage areas, using USGS DEM data, for five returns periods resulting in computation of annualized losses. URS work on the AAL studies is very similar to the scope of this Expression Of Interest. URS Hazus specialists conducted the majority of the 850 county Hazus runs in the three FEMA Regions, including all of West Virginia. The URS project technical leader was Dr. Shane Parson.

To execute the AAL studies, URS established an 80 workstation computational farm that could be accessed by all project staff. Each machine was an exact replica of a workstation template that was built and tested for this effort prior to mirroring. In addition, a simple web-based tool was built to track the simulations, including who executed the run, how long the run took, the number of streams modeled, which machine ran the simulation, and other data. A sample screenshot from the tool is shown in Figure 1; this figure illustrates the scope of the study conducted for FEMA.

Figure 1: *Counties Analyzed by URS for the FEMA Hazus Average Annualized Loss Studies*

This tracking tool provided the information needed to monitor the progress of the study in real-time and the data that allowed the project team to re-trace the steps conducted for quality assurance (QA) purposes.

The actual simulation times shown in Table 1 provide our proposed EP/URS team with an understanding of the level of effort needed to execute this Expression Of Interest. In addition, this past experience provides the EP/URS team with the information needed to stand up another computational farm quickly, size it correctly, and enable it to execute the runs for the WVDHSEM project in an optimal manner.

The EP/URS team understands that Hazus 2.1 may require different levels of computational time and that other factors—such as the computational capabilities of machines leveraged for this effort—will be different than that used for the AAL studies; nevertheless, these data

provide significant insight into the level of computational effort needed to provide WVDHSEM with the required Hazus 2.1 dataset.

Table 1. West Virginia AAL Analysis Results by County

County	Total Reaches	Failed Reaches	Successful Reaches	Simulation Time (hours)
Barbour	24	0	24	33.0
Berkeley	29	0	29	31.6
Boone	29	0	29	158.1
Braxton	36	1	35	248.5
Brooke	20	0	20	176.8
Cabell	25	0	25	183.0
Calhoun	20	0	20	182.8
Clay	24	0	24	176.8
Doddridge	14	0	14	24.8
Fayette	56	1	55	98.5
Gilmer	30	0	30	72.0
Grant	25	1	24	100.2
Greenbrier	68	0	68	168.3
Hampshire	40	1	39	72.0
Hancock	18	0	18	66.4
Hardy	38	0	38	43.5
Harrison	34	1	33	48.0
Jackson	38	0	38	49.0
Jefferson	27	1	26	46.0
Kanawha	27	1	26	50.3
Lewis	28	1	27	35.5
Lincoln	33	0	33	48.4
Logan	34	1	33	98.6
Marion	24	0	24	49.3
Marshall	35	0	35	50.2
Mason	43	1	42	51.3
McDowell	29	2	27	115.1
Mercer	28	2	26	91.6
Mineral	29	1	28	88.7
Mingo	46	2	0	46.4
Monongalia	35	1	34	65.8
Monroe	30	0	30	42.9
Morgan	19	1	18	32.1
Nicholas	45	0	45	47.9
Ohio	13	0	13	44.4
Pendleton	34	0	34	46.9
Pleasants	14	0	14	45.1
Pocahontas	51	0	51	232.8
Preston	41	2	39	89.0
Putnam	25	0	25	47.9
Raleigh	45	0	45	47.8

County	Total Reaches	Failed Reaches	Successful Reaches	Simulation Time (hours)
Randolph	41	2	39	75.4
Ritchie	20	3	17	25.9
Roane	30	0	30	72.6
Summers	41	1	40	72.7
Taylor	23	1	22	81.8
Tucker	27	2	25	72.8
Tyler	22	0	22	73.7
Upshur	23	0	23	48.3
Wayne	39	1	38	75.5
Webster	29	4	25	120.2
Wetzel	23	1	22	24.6
Wirt	24	0	24	47.8
Wood	41	2	39	51.5
Wyoming	28	0	28	47.9

SOURCE: *FEMA Hazus Average Annualized Loss (AAL) Study (2010)*

In addition to allowing the real-time monitoring of the study progress, the tracking tool allowed critical information for QA. The tool tracked simulation analysts, computer used, and data, allowing URS to implement a QA process of re-running 5 percent of all simulations. Using the tracking tool (shown in Figure 2), replicate analyses were conducted by different staff members, on different machines in the computational farm. If an issue was identified, the tool could be used to determine the extent and identify the cause of the underlying issue. More important, the tool helped facilitate where to check for possible issues in other areas.

The EP/URS team proposes to use this tool on the West Virginia Hazus Phase II project.

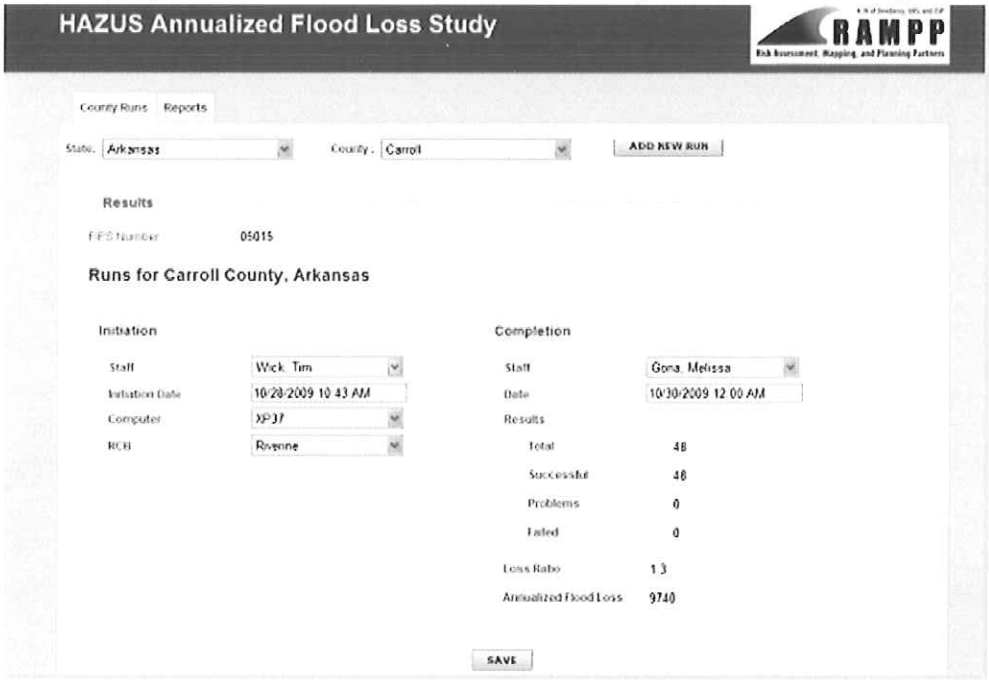


Figure 2: *Online Tracking Tool used by URS during FEMA Hazus Average Annualized Loss (AAL) Study (2010)*

URS, in the role of QA/QC coordinator, found a number of issues in the completed FEMA Hazus AAL Study (2010). The initial AAL values were unrealistically high. After further study by FEMA, numeric corrections were made to the AAL computations in Hazus. The flood depth grids were inconsistent among different return periods. In some instances, for example, the 50-year flood depth grid was wider and deeper than the 100-year depth grid, which is not possible. Again, FEMA instituted a change to the Hazus model to eliminate this anomalous result. As part of RAMPP, URS (especially Dr. Parson, the URS lead for this proposal) actively participated remediating these issues for the latest Hazus release, version 2.1.

URS led the development of written work process document used as the process map by which all modelers conducted data processing and modeling runs. Protocols such as naming conventions and file folder locations were prescribed in this document. The EP/URS team proposes to use a similar written work process for the WVDHSEM Hazus Phase II project. The process adds confidence, reduces costs, and shortens the learning curve for all staff.

Under the Risk MAP contract, URS has been the Hazus subject matter lead on the Non-Regulatory Products Team for 3 years. Responsibilities include development and writing Risk MAP guidelines and specification related to Flood Risk Assessment datasets, which include Hazus and AAL study results. URS also led efforts in developing standards for Hazus in the Flood Risk Database, Flood Risk Report, and Flood Risk Map.

References for Work Performed by URS Include

Michael Powell, CFM
Delaware Dept. Natural Resources
89 Kings Highway
Dover, DE 19901
302-739-9921

Gary Friedman
Emergency Management Specialist
Emergency Management Division
Broward County
201 NW 84 Avenue
Plantation, FL 33324
954-831-3345

Responsibilities of Each Party

EP will be the lead for all coordination efforts with the WVDHSEM, including meetings, preparing and delivering status reports, and developing and submitting the final work products. EP will lead the setup of an Internet-based remote computational farm installation in a West Virginia facility and will conduct some of the Hazus runs. URS will have the lead role in designing the Hazus installation, conducting the Hazus runs, and performing QA and quality control (QC). URS will also assist in coordinating the project and with preparing the final work products.

Assurances of Performance

EP will provide the required Performance Bond for this project.

Section II: Qualification of Staff

This team was formed by Engineering Perfection based on its long-standing, productive relationship conducting many successful projects with URS. Jerry Gilbert worked alongside Shane Parson for multiple National Technical Review (NTR) sessions dating back to 2006. These NTR sessions involve evaluating FEMA Mitigation Grant Applications for Engineering Feasibility and Benefit-Cost Analysis. During an intensive 30-day period that involved 12-hour days, Jerry and Shane worked together through the mentally demanding project to successfully complete the reviews.

In addition to Engineering Perfection's understanding of West Virginia Floodplain Management issues through Jerry's involvement as principle organizer and Chairman of the West Virginia Floodplain Management Association Board, the URS staff members that would work on this effort are the same team members that successfully conducted the 800 runs for the AAL studies.

Alonzo Perry, Jr. of Coalwood, West Virginia stands grim faced in front of his house that had 50 years of memories as well as his beloved Siberian Husky washed away in minutes during the flash flood of May 2, 2002. - Photo by Bob McMilan/FEMA Photo

This team offers the State an expert on flooding issues in the state within minutes from the State's offices who will be the Project Manager for this effort, but also Dr. Shane Parson, who was the architect of AAL studies approach and execution. Dr. Parson is a nationally recognized expert in Hazus, including being part of the Risk MAP Hazus training team and primary author for Hazus sections of upcoming Risk MAP Guidelines and Specifications documents. Also, Dr. Parson is only 2.5 hours from the State's offices by car and can easily meet in person as needed to ensure the State's objectives are met on this effort.

The majority of the simulations will be executed by Vince Legendre and Christopher Gabris who are both certified as Hazus Trained Practioners from the Emergency Management Institute (EMI) and both were involved in the production of the AAL simulations for FEMA.

Finally, the EP/URS team offers expertise, if needed, in topographic datasets through John Knowlton. John's vast expertise in LiDAR through managing scores of projects may be a resource that could be needed if DEM data is suspected as the reason for suspect model results. Based on our historical involvement in executing Hazus simultations for all WV counties, the EP/URS team believes this risk is low but does want the State to know an example of the breadth of expertise that could be brought to successfully complete this effort.

Resumes for the key staff for this project are included in Appendix B. Key staff include:

- Seward Gilbert, P.E., DEE, CFM (EP)

- Dr. Shane Parson, P.E., CFM (URS)
- Vince Legendre (URS)
- Chris Gabris (URS)
- John Knowlton, PMP, GISP (URS)

Section III: Work Plan and Schedule

Work Products

Our proposed end products include the following as a base, with several additional options offered. Items noted in **bold** below are value-added and beyond the minimum RFP requirements.

Base Product: New Hazus 2.1 analysis

New Hazus 2.1 analysis for each county, including:

- Hazus .hpr files containing: **10-, 25-, 50-, 100-**, and 500-year return period losses and annualized losses
- Report output and mapped reports for each county in a customized and client specific format
- **Select values exported to format compliant with FEMA Risk MAP Flood Risk Database standards (Flood Risk Assessment dataset Refined loss tables)**

Hazus calculation routines have changed from Hazus MR3 to Hazus 2.1. Losses calculated using Hazus MR3 for certain return periods should not be combined with losses calculated using Hazus 2.1 for other return periods. All losses should be calculated using the latest version of Hazus in order to produce consistent annualized loss estimates.

We propose to conduct new Hazus 2.1 analyses for 10-, 25-, 50-, 100-, and 500-year return periods and then use those results to calculate annualized losses. These Hazus runs will be provided in the report and mapping format established with the WVDHSEM and as Hazus export .hpr files.

We also propose providing select loss values in a format consistent with FEMA Risk MAP Flood Risk Database standards. When new Risk MAP studies are conducted, new Hazus analyses are include in the Flood Risk Database within the Flood Risk Assessment dataset. Specifically, new Hazus analyses are considered to be refined analyses and are used to populate the L_RA_Refined table. We propose to provide this table for each county, so when Risk MAP studies are conducted in West Virginia, the Hazus 2.1 results can be easily integrated within those studies. By providing these value-added end products, this project can satisfy not only Hazard Mitigation Plans needs, but also Risk MAP project needs.

Option 1: New Hazus 2.1 Analysis plus FEMA AAL studies Data

New Hazus 2.1 analysis for each county, including:

- Hazus .hpr files containing: **10-, 25-, 50-, 100-**, and 500-year return period losses and annualized losses

- Report output and mapped reports for each county in a customized and client specific format
- **Select values exported to format compliant with FEMA Risk MAP Flood Risk Database standards (Flood Risk Assessment dataset Refined loss tables)**
- **FEMA Hazus AAL Study (2010) data (Hazus MR4) for each county**
- **Select values exported to format compliant with FEMA Risk MAP Flood Risk Database standards (Flood Risk Assessment dataset AAL tables)**

For Option 1, we propose to provide the base product plus additional deliverables from the FEMA AAL studies. URS has all of the FEMA Hazus AAL Study (2010) data for West Virginia. Because this RFP is requesting products similar to that study, it would be advantageous for West Virginia to receive the data in several formats. All future Risk MAP projects within West Virginia will require the FEMA Hazus AAL Study (2010) data as one of the end products in a format compliant with FEMA Risk MAP Flood Risk Database standards. By providing the results in the Risk MAP format, West Virginia will have consistent analyses, statewide, and useable for multiple FEMA programs.

Option 2: New Hazus 2.1 Analysis, with enhanced topographic data where available, plus FEMA AAL studies Data

New Hazus 2.1 analysis for each county, including:

- Hazus .hpr files containing: **10, 25, 50, 100, ,** and 500-year return period losses and annualized losses using enhanced topographic data where available
- Report output and mapped reports for each county in a customized and client specific format
- **Select values exported to format compliant with FEMA Risk MAP Flood Risk Database standards (Flood Risk Assessment dataset Refined loss tables)**
- **FEMA Hazus AAL Study (2010) data (Hazus MR4) for each county**
- **Select values exported to format compliant with FEMA Risk MAP Flood Risk Database standards (Flood Risk Assessment dataset AAL tables)**

For Option 2, we propose to provide the base product and Option 1, plus the use of enhanced topographic data. Many counties in West Virginia have higher quality topographic data available from recent LiDAR surveys. EP has the data files for LiDAR covering approximately one-quarter of the state. For Option 2, the new Hazus 2.1 runs would use available enhanced data to provide higher quality analysis. For those counties with this enhanced topographic data, Hazus analysis would have a small additional upfront step of converting the data to a raster format compatible with Hazus. Run times will also increase because of the higher resolution grid. However, working time for Hazus analysts should be the same for both Options 1 and 2, so Option 2 would only add a small additional labor effort.

Proposed Work Plan

Task 1. Project Coordination

1. Project Kick-Off Meeting

Several of the key project participants will meet in person with representatives of WVDHSEM. The purposes of the meeting are to:

- Ensure a common understanding of project objectives
- Transfer data created and compiled in support of the Phase I effort in the possession of WVDHSEM
- Identify other available data sources
- Decide which data sources will be used in the Hazus model execution
- Confirm the scope of work and the detailed plans for execution. This will include a discussion of the FEMA AAL studies and the need for developing end products that satisfy FEMA Risk MAP standards.
- Establish the form and content of final work products
- Describe potential issues in the data and modeling systems that will need to be resolved before Hazus model execution, and plan for their resolution
- Review the project schedule, including intermediate check points, and ensure comprehension of the critical path. Update the schedule as needed.

2. Status Reports

A monthly status report, along with access to the tracking tools, will be provided. Quarterly status reports will also be developed and submitted to WVDHSEM and FEMA Region III.

3. Final Deliverables Meeting/Training

At the end of the project, the EP/ URS team will meet with WVDHSEM to submit the final end products. The team will present project results and training materials to in a comprehensible form to WVDHSEM staff. The training materials (PowerPoint slides and handouts) will also be provided to WVDHSEM for their use in any future or regional training needs.

Task 2. Compilation of Input Data into Digital Library

Data sources include:

- Hazus census, community, and other data sources
- Ground elevation data created as part of the 2003 Statewide Addressing and Mapping Board [2]aerial photography project (3 meter digital elevation models)
- Ground elevation data created by various sources for portions of southern West Virginia, the Kanawha and New River floodplains, and several northern counties, all created with LiDAR
- FEMA AAL studies (.hpr files and Flood Risk Database compliant files)
- U.S. Geological Survey Flood-Frequency Discharges[3]Report "Estimation of Flood-Frequency Discharges for Rural, Unregulated Streams in West Virginia

The data will reside in a digital library as part of the Hazus computational farm (described in Task 4). EP will lead in collecting the data, with support from URS.

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[2] See: http://wvgis.wvu.edu/data/dataset.php?ID=261

[3] Wiley, Jeffrey B. and John T. Atkins, Jr., "Estimation of Flood-Frequency Discharges for Rural, Unregulated Streams in West Virginia," 78 p., 2010.

Task 3. Prepare Product Sample

The team will prepare a sample work product. The sample will be a watershed area within a single county. The sample work product will be submitted for review with WVDHSEM staff. Any shortcomings, formatting preferences, and gaps should be identified at this stage so that the remainder of the work can be completed correctly, the first time performed. Should significant revision to the sample work product be necessary to meet project requirements, a second cycle of sample work product preparation and review will be undertaken. Preparation of the sample product may uncover better sources of data to be used in the analysis, and improvements to the format and presentation of final work products. The preparation, review, and WVDHSEM acceptance of the format, method and sample work product are critical for ensuring that requirements are met and expectations are understood by all involved. Task 3 is intended to eliminate the time, frustration, and cost of redoing work late in the project.

Task 4. Set Up Hazus Computational Farm

A bank of computer resources will be assembled and dedicated to this project. This will allow the analysts to dedicate the majority of their time and attention to project execution. It also reduces the overall time necessary to complete the project.

There are several options for the computational farm. They include, but are not limited to:

- Short-term lease of notebook computers that would be networked for remote access and operation
- Cloud computing, on a site such as that offered by Amazon
- Rental of computers in a computer teaching lab that are equipped with ArcGIS and the necessary extensions

Based on our experience in executing large scale Hazus simulations and analysis of the data collected for WV counties during the AAL studies, we envision a bank of 20 or more computers running in parallel for the execution of this project.

EP and URS will jointly design and select the computational farm and EP will procure it.

Task 5. Document Work Process

We plan to use the work process from the AAL studies as a starting point for this task. Developed for use with Hazus MR4, it will be updated to reflect the use of Hazus 2.1. The work process will includes documentation of each step for the analysts. This will ensure consistency in approach among all staff members and will define the organization of the input and output data. The work process includes a web-based project tracking tool. The tracking tool identifies production issues and delays early in the project and lead to their efficient resolution.

URS will prepare and document the work process. The process is considered proprietary and will not be included in the final project end products.

Task 6. Hazus Computations

The Hazus runs will be performed by county. The work will be divided among several analysts. To perform their work, the analysts will log in remotely from their usual work stations to the individual computers in the computational farm. The web-based project tracking tool will allow

the necessary resources to be applied to resolve any identified issues. If an identified issue is likely to recur or is systemic, the written work process will be revised.

URS will prepare and document the work procedures.

Task 7. Quality Assurance / Quality Control

The team will use the same successful QA/QC approaches that were used for the AAL studies. For example, use of the computational farm will optimize labor time and reduce project execution time. The existing web-based tool from the AAL studies will be leveraged to record and report on results. These results could be provided to the WVDHSEM via the web prior to the team's submittal of the specified end products to provide near-real time status of the project's Hazus runs. For the AAL studies, we captured operational data in conducting AAL that will allow us to optimize this project's execution based on the WVDHSEM's requirements.

An important part of QA/QC is obtaining consistent results. Our QA/QC process includes re-running a representative sample of counties/watersheds to ensure that the model results are consistent. Our process includes using different modelers and different computers between the production and the QC runs. During the AAL studies, this consistency check helped identify issues caused by the Hazus software and issues caused by data limitations. We anticipate that there could be some locations in West Virginia where Hazus may have issues, such as incorrect or missing regression equations for certain stream reaches. Our plan is to identify locations or areas of concern and determine an appropriate course of action. This may require selective integration of Level 2 data, directly working with Hazus developers, and/or discussions with WVDHSEM staff on the impact of the issues.

Task 8. End Products Development

The EP/URS team will develop the final end products using automated approaches. Once the WVDHSEM -specific custom output tables and reports have been established, the team will develop tools to create the deliverable directly from Hazus output tables. These tools will be deployed through the Hazus computational farm so the output tables and reports can be generated for each county once it is considered final. Likewise, similar tools will be used to create the Risk MAP compliant tables for the Flood Risk Database. By having these automated tools, the team will be able to quickly produce end products after Hazus runs are completed and keep to the compressed timeline detailed on our Schedule.

Performance Objectives and Task

The primary objective of this project is to provide information to communities and associated stakeholders regarding their risks to flood losses. With this information, leaders, managers and the public-at-large will be motivated to better plan, prevent, and respond to flood events. For the results of this project to be effective in changing behaviors, the resultant reports must be:

- Credible
- Comprehensive
- Comparable across all parts of West Virginia
- Understandable
- Clear in limitations

Another important objective of the project is to provide data that will allow WVDHSEM to prioritize flood risks throughout West Virginia so that mitigation resources can be effectively allocated to prevent flood losses.

Subcontracting Approach

EP is Prime for this project and URS is a subcontractor. EP and URS have jointly prepared this Expression Of Interest, including the approach, schedule, preliminary cost estimate, and allocation of resources. Our multi-firm team has worked together over the past 6 years and has a demonstrated ability to collaborate, anticipate, and solve problems as they arise. The value of tasks subcontracted from one firm to the other exceeds $200,000 over the past 6 years, and is continuing.

Allocation of Work Tasks

Task	Lead	EP Tasks	URS Tasks	Deliverables
Task 1. Project Coordination	EP	Lead kickoff meeting, prepare and submit project monthly status reports	Assist with kickoff meeting, provide information for status reports, develop tracking tools to allow client access	Kickoff meeting summary, monthly status reports, access to tracking tool
Task 2. Compilation of Input Data into Digital Library	EP	Gather data from West Virginia	Gather data from FEMA and other national sources	Data to be provided as part of final deliverable
Task 3. Prepare Product Sample	URS	Review draft format, assist with client discussion and follow-up edits	Develop draft format, lead discussion with client, and lead follow-up edits	Draft format; Final format
Task 4. Set Up Hazus Computation Farm	EP	Identify the computational farm location and procure computers	Coordinate computer setup and computational farm setup	None
Task 5. Document Work Process	URS	Review draft document	Lead document development	None
Task 6. Hazus Computations	URS	Conduct portions of runs	Conduct majority of runs and oversee computational farm	Client access to tracking tool
Task 7. Quality Assurance / Quality Control	URS	Assist with some QA/QC runs	Lead QA/QC and resolve any issues	Client access to tracking tool
Task 8. End Products Development	URS EP	Assist with developing the automated final end products Lead for final presentation	Lead in developing end products, assist with final presentation	Hard drive(s) with final end products shown in proposal

Schedule

Task	Schedule
Task 1. Project Coordination	Kickoff: Within 2 weeks of Notice To Proceed (NTP) Month Status Report: Throughout project
Task 2. Compilation of Input Data into Digital Library	Complete within 1 month of NTP
Task 3. Prepare Product Sample	Draft format 1.5 months after NTP Final format 3 months after NTP
Task 4. Set Up Hazus Computational Farm	Identify farm location within 1 month of NTP Complete setup by 3 months after NTP
Task 5. Document Work Process	Final version by 3 months after NTP
Task 6. Hazus Computations	Begin at 3 month after NTP, finish by 5 months after NTP
Task 7. Quality Assurance / Quality Control	Conduct in parallel with main effort, complete at same time Task 6
Task 8. End Products Development	Automated deliverable developed as part of analysis process Manual end products mostly done within analysis time frame All deliverables ready by 6 months after NTP.

Appendix A: Sample of Work Performed by Engineering Perfection

HYDRAULIC INVESTIGATION
for Natural Gas Development Site
Eli Yoder MSH Site
Washington District
Marshall County, West Virginia

Prepared for:

Mr. David Jackson PS
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October 27, 2011

HYDRAULIC INVESTIGATION
for Natural Gas Development Site
Eli Yoder MSH Site
Washington District
Marshall County, West Virginia

TABLE OF CONTENTS

HYDRAULIC INVESTIGATION
for Eli Yoder MSH Natural Gas Development Site
Washington District, Marshall County, West Virginia

1 PURPOSE

Engineering Perfection was requested by Jackson Surveying, Inc. to determine the base flood elevation for a natural gas development site located near Little Grave Creek, in Washington District, Marshall County, West Virginia. A determination of the rise in water surface elevation for the Base Flood event for a proposed pad design was also requested. The term Base Flood is the predicted flood event with a one percent probability of being equaled or exceeded in any given year and is used extensively in the Federal Emergency Management Agency program for flood insurance. The Base Flood has also been incorporated in local ordinances, including the floodplain ordinance for Marshall County.

This investigation was conducted using HEC-RAS to model the effect of pad design on the base flood event on Little Grave Creek for the area of interest labeled as "Pad" on "Proposed Contour Plan", Sheet 3 of 15. The HEC-RAS model was compiled using survey data provided by Jackson Surveying Inc.

2 SITE DATA

The site is located in Marshall County, along Little Grave Creek at longitude 80.726181W and latitude 39.954715N. The FEMA Community-Panel number is 54051C0078E with an effective date of September 25, 2009. On the Flood Insurance Rate Map, a portion of this area is shown to be an A Zone.

Site data used in this project included the following:

1. Topographic cross sections, elevations, and photographs provided by Jackson Surveying. The data forms included textfile and portable document format files. A detailed list of the data provided is listed in Appendix A.
2. The Base Flood flow rate for Little Grave Creek was calculated using a report by the US Geological Survey.[1]
3. Aerial photography, and topographic map data obtained from the West Virginia Geographic Information System Technical Center, at West Virginia University in Morgantown.
4. High resolution National Hydrography Dataset files obtained from the US Geological Survey.

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[1] Wiley, J.B. and J. T. Adkins, "Estimation of Flood-Frequency Discharges for Rural, Unregulated Streams in West Virginia, U. S. Geological Survey Scientific Investigations Report 2010-5033, 2010.

3 HYDRAULIC ANALYSIS

The hydraulic analysis was comprised of five elements. They were:

- determination of drainage area,
- determination of flow during the Base Flood event,
- preparation of cross section data for the HEC RAS model,
- execution of the HEC RAS model, and
- analysis of the results.

Determination of Drainage Area

The area draining to Little Grave Creek at the site was determined by first selecting those subwatersheds in the National Hydrography Dataset discharging to this location. The drainage area was determined to be approximately 9.7 square miles.

Determination of Flow During Base Flood Event

The Base Flood discharge was computed using the regional regression equation developed by the US Geological Survey (see Reference 1). Monongalia County is located in the Western Plateaus Region of West Virginia according to the USGS report. The equation for estimating flood-frequency discharge for the one percent probability storm event or PK100 is:

PK100(1%AOP)=557DRNAREA^0.674

where DRNAREA is the drainage area in square miles to the point of interest. Applying this equation to the area, the resultant Base Flood discharge is 2,578 cfs. Further information is provided in Appendix B.

Preparation of Cross Sections for HEC-RAS Model

Six cross sections were initially prepared for use in the HEC-RAS model. They are illustrated in Figure 1 below. After viewing the results of a trial run of the surveyed cross sections in HEC-RAS, it was determined more cross sections were needed to stabilize the model. In addition to using multiple interpolated cross sections within the model, cross sections were also copied from survey data.

Figure 1 Location of Cross Sections and Area of Interest

The elevation data for the cross sections were obtained by field surveying collected by Jackson Surveying in October 2011.

Jackson Surveying used an elevation reference monument located near the site. The datum used in the Jackson Surveying data was in NAVD 88 and all elevations presented in this report are referenced to this datum.

Two cases were modeled in this investigation: the existing case and the proposed case. Both the existing and proposed case used the same flow rate of 2578 cfs and contained the same cross section data except for the area of the proposed pad. Cross sections 669 through 1343 of the proposed case contain cross section data that includes a pad at a height of 736.09 feet.

The cross section information includes estimates of the Manning's roughness coefficient. Survey data as well as location photographs were used to confirm these values and to determine placement of these values along the modeled cross section geometry. For Little Grave Creek, the stream center roughness in the model was 0.045 (main channel clean, straight, no rifts or deep pools, some weeds and stones[2]) and for the overbank areas, .070 (floodplain medium to dense brush, in winter) was used.

HEC-RAS model

The U.S. Army Corps of Engineers Hydrologic Engineering Center developed the River Analysis System, or HEC-RAS. Version 4.1.0, issued January 2010, was employed in this study. The study employed the steady state model. Results of the modeling are provided in Table 1 below. Detailed model output tables and images are provided in Appendix C.

[2] Chow, Ven Te, "Open-Channel Hydraulics," McGraw Hill, 1959

Table 1 HECRAS Cross Section Data

River Station	Plan	Water Surface Elevation, ft.
1955	Preconstruction	743.17
1955	PostConstruction	743.17
	Difference	0
1885	Preconstruction	743.1
1885	PostConstruction	743.1
	Difference	0
1835	Preconstruction	738.87
1835	PostConstruction	738.87
	Difference	0
1785	Preconstruction	738.46
1785	PostConstruction	738.46
	Difference	0
1637.66*	Preconstruction	737.26
1637.66*	PostConstruction	737.26
	Difference	0
1490.33*	Preconstruction	736.01
1490.33*	PostConstruction	736.42
	Difference	0.41
1343	Preconstruction	735.62
1343**	PostConstruction	735.88
	Difference	0.26
1147.2*	Preconstruction	734.01
1147.2**	PostConstruction	734.39
	Difference	0.38
951.4	Preconstruction	732.99
951.4**	PostConstruction	732.92
	Difference	-0.07
904.37*	Preconstruction	732.64
904.37**	PostConstruction	732.58
	Difference	-0.06
857.34*	Preconstruction	732.28
857.34**	PostConstruction	732.2
	Difference	-0.08
810.31*	Preconstruction	731.87
810.31**	PostConstruction	731.8
	Difference	-0.07
763.28*	Preconstruction	731.41
763.28**	PostConstruction	731.39
	Difference	-0.02
716.25*	Preconstruction	730.98
716.25**	PostConstruction	730.96
	Difference	-0.02
669.22*	Preconstruction	730.55
669.22**	PostConstruction	730.52
	Difference	-0.03
622.19*	Preconstruction	730.11
622.19*	PostConstruction	730.11
	Difference	0
575.16*	Preconstruction	729.66
575.16*	PostConstruction	729.66
	Difference	0
528.129*	Preconstruction	729.23
528.129*	PostConstruction	729.22
	Difference	-0.01
481.1	Preconstruction	728.82
481.1	PostConstruction	728.82
	Difference	0

*Denotes a HECRAS interpolated cross section
**Denotes a HECRAS cross section modified to include post-construction conditions

4 CONCLUSIONS

The cross sections through the proposed project range from 669 to 1343. The Base Flood Elevation for the proposed condition ranges from 730.5 feet at the downstream extent of the project and 735.9 feet at the upstream extent. The maximum water surface increase resulting from the project is 0.4 feet.

5 LIMITATIONS

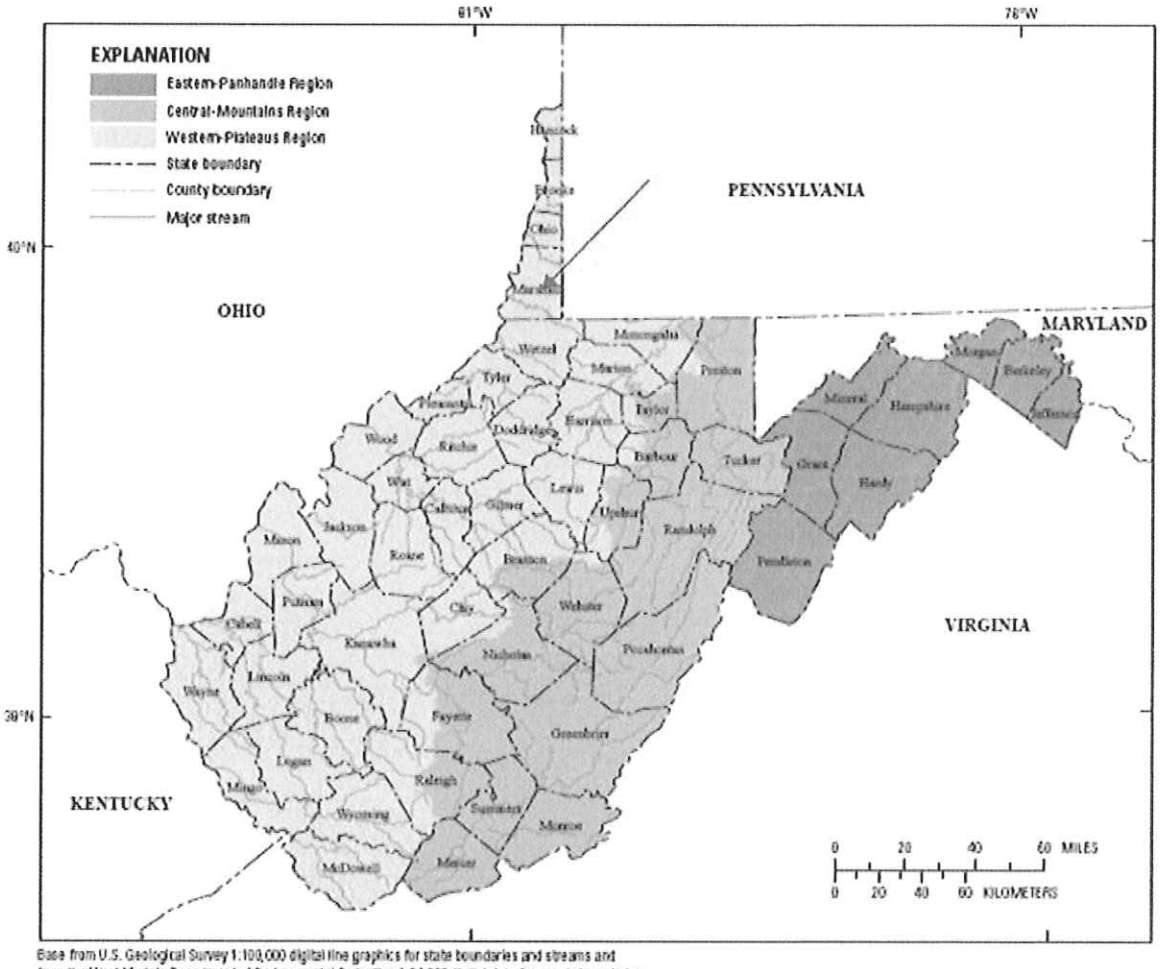
The conclusions submitted in this report apply to the proposed project only. They are not applicable to on-site subsequent construction, or adjacent or nearby projects. In the event that conclusions or recommendations based on this report and relating to any other projects are made by other, such conclusions and recommendations are not the responsibility of Engineering Perfection, PLLC. In performing our professional services, we used that degree of care and skill ordinarily exercised under similar circumstances by members of the engineering profession. No other warranty, expressed or implied is made.

Appendix A
Data Provided by Jackson Surveying

"Eli Yoder MSH Site Plan," October 20, 2011 (Eli Yoder MSH 10-21-11.pdf)
Text file of survey coordinates for cross sections

Appendix B:
Regional Regression Analysis

Regression Equation Regions



Base from U.S. Geological Survey 1:100,000 digital line graphics for state boundaries and streams and from the West Virginia Department of Environmental Protection 1:24,000 digital data for county boundaries. Universal Transverse Mercator projection, zone 17, NAD 83.

Figure 4. The Eastern Panhandle, Central Mountains, and Western Plateaus Regions of West Virginia for which equations for estimation of flood frequency discharges were developed in this study.

Regression Equation

Table 4. Equations used to estimate selected flood-frequency discharges for streams in the Eastern Panhandle, Central Mountains, and Western Plateaus Regions of West Virginia.

[PK(n_n), peak discharge in cubic feet per second for the (n.n)-year recurrence interval; PK(n), peak discharge in cubic feet per second for the (n)-year recurrence interval; %, percent; AOP, annual-occurrence probability; DRNAREA, drainage area in square miles]

Equation	Standard error of the model, in percent	Average standard error of sampling, in percent	Average prediction error, in percent	Equivalent years of record, unitless
Eastern Panhandle Region (Range in DRNAREA from 0.21 to 1,461 for 57 streamgage stations)				
PK1_1(90%AOP) = 29.6 DRNAREA$^{0.818}$	43.4	10.3	44.8	3.4
PK1_5(67%AOP) = 46.4 DRNAREA$^{0.828}$	35.7	8.9	36.9	3.3
PK2(50%AOP) = 59.8 DRNAREA$^{0.832}$	32.1	8.6	33.4	4.1
PK5(20%AOP) = 105 DRNAREA$^{0.838}$	25.6	8.9	27.2	10.6
PK10(10%AOP) = 145 DRNAREA$^{0.842}$	22.5	9.5	24.5	19.1
PK25(4%AOP) = 204 DRNAREA$^{0.848}$	19.7	10.3	22.4	34.1
PK50(2%AOP) = 254 DRNAREA$^{0.852}$	18.6	11.1	21.7	46.1
PK100(1%AOP) = 307 DRNAREA$^{0.855}$	18.3	11.6	21.7	56.7
PK200(0.5%AOP) = 365 DRNAREA$^{0.859}$	18.4	12.4	22.4	64.7
PK500(0.2%AOP) = 447 DRNAREA$^{0.864}$	19.4	13.5	23.8	70.9
Central Mountains Region (Range in DRNAREA from 0.10 to 1,619 for 83 streamgage stations)				
PK1_1(90%AOP) = 33.4 DRNAREA$^{0.914}$	40.0	8.3	41.0	2.4
PK1_5(67%AOP) = 53.8 DRNAREA$^{0.887}$	34.6	7.3	35.4	2.0
PK2(50%AOP) = 69.4 DRNAREA$^{0.873}$	33.4	7.3	34.2	2.1
PK5(20%AOP) = 116 DRNAREA$^{0.845}$	34.1	8.0	35.1	3.2
PK10(10%AOP) = 153 DRNAREA$^{0.831}$	36.3	8.6	37.4	4.0
PK25(4%AOP) = 206 DRNAREA$^{0.816}$	39.9	9.8	41.2	4.8
PK50(2%AOP) = 250 DRNAREA$^{0.807}$	42.9	10.6	44.4	5.3
PK100(1%AOP) = 297 DRNAREA$^{0.800}$	46.2	11.3	47.9	5.6
PK200(0.5%AOP) = 347 DRNAREA$^{0.793}$	49.7	12.0	51.5	5.9
PK500(0.2%AOP) = 420 DRNAREA$^{0.785}$	54.3	13.1	56.3	6.1
Western Plateaus Region (Range in DRNAREA from 0.13 to 1,516 for 106 streamgage stations)				
PK1_1(90%AOP) = 56.9 DRNAREA$^{0.765}$	38.2	7.6	39.1	3.8
PK1_5(67%AOP) = 97.8 DRNAREA$^{0.741}$	33.4	6.5	34.1	2.8
PK2(50%AOP) = 129 DRNAREA$^{0.730}$	31.6	6.1	32.2	2.8
PK5(20%AOP) = 221 DRNAREA$^{0.710}$	29.3	6.5	30.0	4.4
PK10(10%AOP) = 292 DRNAREA$^{0.699}$	28.9	6.5	29.7	5.9
PK25(4%AOP) = 391 DRNAREA$^{0.688}$	29.4	7.3	30.3	7.9
PK50(2%AOP) = 472 DRNAREA$^{0.681}$	30.2	7.6	31.3	9.1
PK100(1%AOP) = 557 DRNAREA$^{0.674}$	31.4	8.0	32.5	10.1
PK200(0.5%AOP) = 647 DRNAREA$^{0.668}$	32.7	8.3	33.9	10.8
PK500(0.2%AOP) = 775 DRNAREA$^{0.661}$	34.8	8.9	36.1	11.4

Regression Computation

$$Q = 557 \times 9.7^{0.674} = 2578 \text{ cfs}$$

Appendix B: Resumes for Key Staff

S.G. (Jerry) Gilbert, PE, DEE, CFM
jerry@engineeringperfection.net

PROFESSIONAL EXPERIENCE

ENGINEERING PERFECTION, PLLC South Charleston, WV 2004-Present
Environmental and Civil Engineer, Business Owner

- Evaluated natural hazard reduction projects for locations throughout the USA for FEMA, for benefit-cost and engineering feasibility.
- Provided training to state and local officials on behalf of FEMA on the Benefit-Cost Analysis system used in national grants program. Modules presented include the basics for tool use, Flood, and Damage-Frequency Assessment.
- Performed floodplain analyses for private property owners throughout West Virginia. Scope included land surveying, GIS, regulatory interpretation, HEC-RAS analysis, and detailed report preparation.
- Performed engineering analyses supporting flood litigation in West Virginia. Developed Geographic Information System databases. Prepared court documents, provided deposition.
- Developed stormwater, erosion and sediment control permits for 700 acre residential development.
- Determined flood prevention benefits for two stream restoration projects in West Virginia for FEMA. Prepared comprehensive report for publication by FEMA.
- Analyzed methods of estimating flood heights on small West Virginia streams for the West Virginia Office of Emergency Services. Prepared concise report with documentation supporting findings.
- Designed, developed and deployed *myfloodalert.com*, a web based real time flood warning system.
- Evaluated civil and environmental engineering universities for accreditation by ABET, Inc. Evaluated program content, transcripts, and facilities for compliance with ABET requirements. Prepared comprehensive reports.

THE DOW CHEMICAL COMPANY, South Charleston, WV 2001-2004
Remediation Leader

- Completed remediation of metals reclamation site in Texas, located in a residential area (contaminants include lead and PCBs). Led litigation defense team.
- Completed destruction of dioxin-contaminated groundwater in Canada
- Defined numerous opportunities for cost reduction and improvements in efficiencies in the Dow environmental remediation program

UNION CARBIDE CORPORATION, South Charleston, WV 1976-2001
Program Manager and Environmental Engineer (1976-2001)

- Completed the site investigation, detailed design and construction for environmental remediation of numerous large manufacturing sites.
- Negotiated administrative consent orders with state and federal governments.
- Manager for construction valued at >$15 million.
- Completed remediation of metals manufacturing facility with low level radioactive contamination. Obtained Removal by the Nuclear Regulatory Commission from the Site Decommissioning Management program.

- Led design teams for industrial wastewater treatment, groundwater remediation, soil remediation, and landfill closure.
- Prepared project justifications that included detailed cost estimates, evaluation of time value of money, depreciation, tax consequences, and alternative analyses.

PURDUE UNIVERSITY, West Lafayette, IN 1974-1976
Graduate Student
Performed physical and chemical analyses of West Lafayette public wastewater system for operations and permit compliance.

US PUBLIC HEALTH SERVICE, Escondido, CA 1971-1974
Commissioned Officer, Field Engineer for US Indian Health Service
- Designed, constructed, and started up sanitation facilities for rural Indians, responsible for $1 million in construction (community water supplies, wastewater collection, anaerobic lagoon, leach field systems).
- Negotiated legal agreements with Indian tribes on behalf of the federal government.

EDUCATION

- B.S. in Civil Engineering, Clarkson College (now Clarkson University)
- M.S. in Civil Engineering, Purdue University

PROFESSIONAL REGISTRATIONS

- Registered Civil Engineer in California, New Jersey, and West Virginia

PROFESSIONAL ORGANIZATIONS

- Chair of Board for West Virginia Floodplain Management Association
- Evaluator of civil and environmental engineering programs for accreditation, representing ABET, Inc., the American Society of Civil Engineers, and the American Academy of Environmental Engineers

CERTIFICATIONS AND TRAINING

- Six Sigma Black Belt[1]
- Certified Floodplain Manager by the Association of State Floodplain Managers
- HAZWOPPER 40 hour trained, with supervisory experience
- Benefit Cost Analyst and Trainer for FEMA
- Board Certified by the American Academy of Environmental Engineers
- Licensed Short-Term Substitute Teacher by the West Virginia Board of Education

[1] "Six Sigma" is a disciplined, data-driven methodology for eliminating defects in any process. "Black Belt" indicates the level of Six Sigma proficiency – fully capable of independent work.

URS

Shane Parson, PhD, PE, CFM

Program Manager

Areas of Expertise

- Hazard Mitigation Planning: Loss Avoidance Analysis, FEMA Hazard Mitigation Plans, Hazard Mitigation Grants. Benefit-Cost Analysis
- Water Resources: Stormwater Management and Modeling, Floodplain Management and Mapping, Water Quality Analysis and Modeling
- Geographic Information Systems: Applied GIS for Engineering and Environmental Projects, Floodplain Mapping, Data Conversion, Needs Assessments, Map Production

Years of Experience

With URS: 4 Years
With Other Firms: 12 Years

Education

PhD/Agricultural and Biological Engineering/1999/Pennsylvania State University

MS/Agricultural and Biological Engineering/1995/Pennsylvania State University

BS/Agricultural Engineering/1994/Virginia Polytechnic Institute and State University

Registration/Certification

2001/Professional Engineer/VA/035106

2003/Association of State Floodplain Managers/Certified Floodplain Manager

Overview

Technical Lead Overview

Dr. Parson is Program Manager at the URS Salem, Virginia Office. His expertise is in hazard mitigation planning, water resources engineering, and geographic information systems, with recent experience working for the RCPT under the Regional Debris Risk and Response Task Order. He has a varied background in private consulting as well as higher education and training, including teaching applied GIS for Civil Engineering as an adjunct professor at Virginia Tech. He was President of the Virginia Floodplain Management Association for five years (2004-2009).

Project Specific Experience

Hazard Mitigation Planning: Development of Job Aid for Using HAZUS-MH in Hazard Mitigation Plans, FEMA Headquarters, Washington, DC. Technical Writer for URS. This task order for the Federal Emergency Management Agency (FEMA) had URS developing a job aid document to assist local and state governments with using results from the HAZUS-MH model to create hazard mitigation plans. The specific responsibility was the development of a chapter of the document on the integration of HAZUS-MH results into mitigation plan goals and objectives.

Flood Mitigation: Loss Avoidance Study for Federal Emergency Management Agency (FEMA)-Funded Projects in Southern California, FEMA Headquarters, Washington, DC. Loss Modeling Analysis for URS. This study, through the Federal Emergency Management Agency (FEMA) Hazard Mitigation Technical Assistance Program (HMTAP), had URS conduct a retroactive analysis of FEMA-funded flood mitigation projects in Southern California. The flood losses anticipated from past extreme storm events were calculated for a variety of projects including flood channel improvements, detention basins, and pump stations. Loss estimation required extensive data gathering, weather data analysis, hydrologic and hydraulic modeling, flood inundation mapping, and flood depth-damage loss calculations. LIDAR-based elevation data was used in several communities to develop flood depth surfaces in GIS.

Virginia Statewide Level 1 HAZUS-MH Hurricane Analysis, Virginia Department of Emergency Management (VDEM), Richmond, Virginia. CGIT conducted HAZUS-MH model runs individually for over 130 counties and cities in Virginia. Forty-two different data layers were extracted from HAZUS-MH including including residential home values, demographics, wind speed for different return frequencies, and residential hurricane wind damage predictions. Data layers were used to produce hardcopy and softcopy map atlases for use at the Virginia Emergency Operations Center.

State Hazard Mitigation Plan for Virginia, Virginia Department of Emergency Management (VDEM), Richmond, Virginia. *Assisting*

URS

Vincent Legendre

GIS Analyst

Areas of Expertise

- GIS Analysis
- GIS Application Development
- Database Management
- Disaster Response

Years of Experience

With URS: 6 Years
With Other Firms: 14 Years

Education

MS/Computer Systems Management/2009/University of Maryland - University College

Graduate Certificate/Database Systems Technologies/2006/ University of Maryland – University College

BA/Geography/1995/West Chester University

Overview

Mr. Legendre has over 14 years of experience in the field of Geographic Information Systems (GIS). During his career he has been involved in map production, application development, database development and design and spatial analysis. Mr. Legendre is familiar with a wide range of ESRI products including ArcInfo Workstation, ArcGIS, ArcGIS Server and ArcSDE. He has experience using a variety of programming languages including AML, ArcObjects, Python and VBA. As a member of the URS Technology Solutions group he is responsible for GIS data and database development, spatial analysis and application development. He recently completed all the course work for the HAZUS Trained Practioner certification.

Project Specific Experience

GIS Analyst, Washington Metro Area Transit Authority, Washington (WMATA), D.C. Mr. Legendre is currently involved in the design and implementation of an enterprise ArcSDE database. Mr. Legendre has been involved in the design of the data model, and creation of the feature and relationship classes as well as data tables. Prior to any data being loaded into the database, he was responsible for extracting and transforming the existing WMATA data , assigning primary and foreign keys and verifying relationships to insure that the data met the requirements of the data model. The ArcSDE database will be stored in SQL Server and it will use ArcGIS 10 technology.

GIS Analyst, URS Gaithersburg Risk MAP Data Center. In support of the Risk MAP contract, Mr. Legendre is responsible for maintaining the URS Gaithersburg data center. The data center consists of two application servers running ArcGIS and custom GIS software and a back-end database with SDE and SQL Server installed. Mr. Legendre installed all the GIS software on the application servers and is also responsible for installing software updates when necessary. He installed SDE on the database server and in addition creates users and performs database administration tasks such as tuning.

GIS Analyst, Tulsa County, Oklahoma, HAZUS Pilot Project. As part of a team composed of engineers and GIS staff, Mr., Legendre was responsible for updating the Essential Faculties (EF) and the General Building Stock (GBS) for the county. This effort involved using FEMA's Comprehensive Data Management System (CDMS) to update the County's data. The data update process involved reviewing and editing spreadsheets, including correcting addresses, and parcel data provided by various project stakeholders in order to identify new EF facilities not currently in the existing database. Each facility was then geocoded and loaded into the existing database using CDMS. The updated database was then used to conduct a 100 year flood loss analysis with the HAZUS Flood module. (2010)

GIS Analyst, FEMA Risk MAP, HAZUS Annualized Loss Estimate (ALE). Mr. Legendre managed a project team of eight

people that used HAZUS to determine average annualized losses for 870 counties in FEMA Regions II, III and VI for both coastal and riverine flooding. In addition, Mr. Legendre was also responsible for overseeing the setup and maintenance of the 75 laptop computer farm used to conduct the analysis. This included installing HAZUS, creating users accounts and dealing with system and software errors. Mr. Legendre was also responsible for the final client deliverable which included 870 .hpr files as well as a spreadsheet that contained annualized loss data for each county. (Ongoing)

GIS Analyst, United States Postal Inspection (USPIS) GIS Support, Washington, DC. Since September 2006, Mr. Legendre has provided on-site GIS support to the USPIS. This support has involved creating maps, data, advising staff on software purchases and determining client GIS needs. From 2008 to 2010, Mr. Legendre was involved in an effort to implement an enterprise ArcGIS Server for the USPIS. Mr. Legendre has been involved in all aspects of the implementation including designing maps, creating geoprocessing and map services, writing design documents and application testing. The approximate size of the current contract is $250K. (2006-2010)

GIS Analyst, Federal Emergency Management Agency (FEMA) Digital Flood Insurance Mapping (DFIRM) Projects. Gaithersburg, MD. Mr. Legendre has performed a wide range of tasks for DFIRM activities at URS. These tasks have included creating the base terrain data for DFIRM studies using contour and LIDAR data. Mr. Legendre was also involved in converting Microstation studies to a FEMA compliant GIS format in addition to training staff in GIS techniques. Mr. Legendre also aided in the design and development of a ArcGIS extension to automate the creation of DFIRM maps and data. This included writing use case documents, computer code and application testing. (Ongoing)

GIS Analyst, Dulles Airport Joint Permit Application (JPA), Gaithersburg, MD. Mr. Legendre created maps that displayed the results of spatial analysis conducted on wetlands and streams at Dulles Airport in Virginia. The purpose of the analysis was to determine how many acres of wetlands and miles of streams would be adversely impacted by the addition of two runways. This analysis involved geoprocessing the proposed features such as runways, roadways and storm drains with the wetlands and streams in order to determine the environmental impact of new runway construction. (2005)

GIS Developer, North Carolina Debris Removal Project, Raleigh & Greensboro, NC. In December of 2002 and February 2003, ice storms caused severe damage across more than a dozen counties in North Carolina. Mr. Legendre provided GIS support for the project. This support included converting GPS coordinates to GIS point shapefiles and creating maps to display project progress, assisting in the creation of an ArcIMS site and a web-enabled SQL Server database for entering and displaying data, creating an ArcObjects application to display project progress based on data collected in the field and creating a MapObjects application to display GPS points, data, and images that were linked to each point. (2003)

GIS Technician, National Imagery and Mapping Agency (NIMA), Conversion of Digital Nautical Charts (DNC), Greenbelt, MD. While working for a NIMA contractor, Mr. Legendre was responsible for the conversion of DNC products from paper to digital format. His responsibilities included collecting, attributing, edge matching and map joining these products, as well as Quality Assurance and Quality Control. He eventually trained new employees on mapping process. The contract amounts ranged from $250 to $330K per project. (2000)

Chronology

2005-present: URS; Gaithersburg, MD
2004-2005: Lockheed Martin; Arlington, VA
2001-2004: PBS&J; Beltsville, MD
2000-2001: BGE; Baltimore, MD
1998-2000: Greenhorne & O'Mara; Greenbelt, MD
1997-1998: Advanced Technology Solutions; West Chester, PA

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URS

Christopher Gabris

GIS Specialist

Areas of Expertise

- GIS
- Cartography
- Hazus-MH
- LiDAR QA/QC

Years of Experience

With URS: 2 Years

Education

BS/Geography/2009/The Pennsylvania State University/ Minor/Information Sciences and Technology for Earth and Mineral Sciences/2009/The Pennsylvania State University

Overview

Mr. Gabris graduated from The Pennsylvania State University in the Spring of 2009 with a degree in Geography, specializing in GIS, while developing skills in GIS applications, image analysis, remote sensing, cartography, spatial analysis and geospatial information management. While at Penn State, he worked as an Undergraduate Research Assistant for the Department of Geography, performing GIS analysis, general reference and thematic mapping and geospatial data management for multiple research projects. Since working at URS, he has contributed on projects utilizing GIS, cartographic and geospatial technology applications. Mr. Gabris completed FEMA's Hazus Trained Practitioner certification program in the Fall of 2010 and is currently pursuing a Master in Professional Studies at the University of Maryland Baltimore County for Geographic Information Systems.

Project Specific Experience

GIS Specialist, Regional Resiliency Assessment Program (RRAP), DHS/Office of Infrastructure Protection

- Provide GIS analysis and mapping services for the overall RRAP program objectives of regional spatial analysis and the assessment of regional interconnectivity of critical infrastructure and key resources (CIKR)
- Use GIS to create Site Assistance Visit (SAV) background graphic packages including data for emergency services, population statistics, site-specific orthophotography and the identification of access roads to provide CIKR owners/operators with information for protective measures and identify potential vulnerabilities and security gaps
- Assist in the identification of new and existing sources of data for sector analysis including communication, transportation, energy, water/waste-water and government facilities (2009-2011)

GIS Specialist, Shell Oil, BP Oil

- Assist on the creation of GIS base maps for Shell and BP clients
- Create location maps, utility hazard maps, and detailed site data
- Geo-reference site plan data, air photos, and field data
- Work with database management team to display sampling data (2009-Present)

GIS Specialist, Master Planning Services and Environmental Assessment, USACE Huntington District, West Virginia

- Provide geospatial data creation, collection, and overall mapping support of the Environmental Assessment (EA) and Master Planning Services (MP) including site, hydraulic, geologic, mineral and recreation maps
- Help identify new and existing data sources for support and analysis of project study regions
- Geo-reference historic real estate maps, digitize surface and mineral tracts, and cross-reference for data accuracy with Real Estate

Management Information System (REMIS)
- Develop, maintain, and manage a geographic database for coordinated map production and analysis of all project sites outlined in the task order (2009–Present)

GIS Specialist, Hazus Average Annualized Loss (AAL) and Average Annualized Loss Usability Study (AALU), FEMA RiskMAP
- Use Hazus to perform a Level One flood hazard analysis for riverine and coastal counties in FEMA Regions II, III and VI
- Study AAL and National Flood Hazard Layer (NHFL) boundaries for floodplain correlations
- Help write procedures technical documents as a subject matter expert (2009-Present)

GIS Specialist, North Carolina Statewide Digital Orthophotography Project 2010, Geospatial & Technology Management Office, NC Division of Emergency Management
- Use ArcGIS to QA/QC eastern half of North Carolina for orthophoto completeness, radiometric consistency and seam line accuracy
- Responsible for data management and supervision of up to three QA/QC technicians
- Interim managerial responsibilities including updating weekly team reports, coordinating with contractors and facilitating QA/QC process (2010–2011)

GIS Specialist, 2010 Aerial Photography Mission Basemap Update, Federal Aviation Administration (FAA), William J. Hughes Technical Center, Atlantic City International Airport, NJ
- Use DAT/EM software and stereo imagery to map site features at spot elevation in accordance with FAA accuracy and quality standards (2011-Present)

LiDAR Technician, PAMAP Program
- Use geospatial software including ArcGIS, GeoCue and FugroViewer to QA/QC acquisition data
- Responsible for the data management of breakline, contour, DEM and LAS files for the state of Pennsylvania
- Compose data delivery packages utilizing GeoCue's Distributed Production Management System (DPMS) method (2009-2011)

LiDAR Technician, Florida Coastal Mapping Program, Florida Division of Emergency Management (FDEM)
- Use geospatial software including ArcGIS, Google Earth, Quick Terrain Modeler, GeoCue and FugroViewer to QA/QC LiDAR acquisition data
- Responsible for the verification of 3D hydro-enforced breaklines, 1 and 2-foot contours and digital color orthophotography against terrain (2009-2010)

LiDAR Technician, Texas Aerial Acquisition, Texas

URS

Texas Water Development Board (TWDB)

- Use geospatial software including ArcGIS, Google Earth, Quick Terrain Modeler, GeoCue and FugroViewer to QA/QC LiDAR acquisition data
- Verify data accuracy of raster imagery, and perform density, bare earth DEM and intensity image analyses (2009–Present)

Specialized Training

Certified Hazus Trained Practitioner, The Emergency Management Institute (EMI), Emmitsburg, MD

- 2010 / Basic Hazus-MH
- 2010 / Application of Hazus-MH for Risk Assessment
- 2010 / Hazus-MH for Flood
- 2010 / Comprehensive Data Management

Professional Societies/Affiliates/Honors/Awards

Gamma Theta Upsilon - An International Honor Society in Geography
URS Gaithersburg Rising Star Performance Excellence Award (2010)
URS Certified Project Administrator (2011)

Chronology

08/09-Present: URS, Gaithersburg, MD
01/07-05/09: The Pennsylvania State University Department of Geography, University Park, PA (Undergraduate Research Assistant)

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Email address:	chris.gabris@urs.com

URS

John C. Knowlton III, PMP, GISP

Geospatial Technology Specialist

Areas of Expertise

- GIS and Geospatial Project/Program Manager
- Strategic Analysis
- Technical Writing & Communication

Years of Experience

With URS: <1 Year
With Other Firms: 11 Years

Education

BS/Biology/1993/University of Maryland

Registration/Certification

2005/Project Management Professional (PMP) #290756

2009/Geographic Information Systems Professional (GISP) #62070

Overview

Mr. Knowlton has over 11 years of experience in the GIS and geospatial industry. He has extensive experience in communication, technical writing, project/program management, and resource management. He has managed hundreds of GIS/Geospatial projects and been supervisor to project and program management staff at a leading geospatial firm. His management experience includes the 2009 North Carolina Statewide Orthophotography QA/QC program, the 2010 Alaskan Statewide Digital Mapping Initiative (SDMI), as well as thousands of square miles of national and international LiDAR and orthophotography project management.

Project Specific Experience

LiDAR Data Imagery Quality Assurance

Geospatial Technology Specialist, 2012 Kansas LiDAR QA/QC, State of Kansas, Kansas Department of Administration, Multi-Year IDIQ, $500,000. Responsible for the technical management of Quality Control and Quality Assurance Services for high resolution LiDAR terrain data covering 11,000 square miles of the state of Kansas. Responsibilities include planning and execution of QA checkpoint field surveys, communication and coordination with multiple aerial data vendors, product oversight of quantitative and qualitative QC analysis, calculation and review of product data accuracies, and final reporting preparation.

Geospatial Technology Specialist, High Priority Imagery & Data Sets (HPIDS), Texas, Texas Water Development Board, Multi-Year IDIQ, $250,000. Responsible for the administration and technical management of Quality Control and Quality Assurance Services for high resolution LiDAR terrain data. Responsibilities include RFP review and response including estimation, planning and management of QA checkpoint field surveys, aerial data vendor communication and coordination, qualitative checks of terrain data products, vertical and horizontal accuracy analysis, oversight of QA process improvement, and reporting.

Fugro EarthData, Inc., Frederick, MD, 2009-2012. A global remote sensing, mapping, and GIS services organization that provides customized products and solutions to support a wide range of land-use and natural resource management activities.

Director of Program Management (2009-2012)

- Direct supervisor for all project and program management staff.
- Active participant in RFP review, go/no go decisions, estimate preparation, and proposal development.
- Member of core management team responsible for monthly revenue review, revenue forecasting, analysis of performance, and accounts receivable.
- Technical writing in the form of daily/monthly reporting, project related technical and final reports, proposal writing, project presentations, and conference presentations.

- Creation and maintenance of all project and program management ISO 9001 documentation.
- CONUS and OCONUS travel in support of short list interviews kick off meetings, pilot project meetings, project closeout meetings, and conferences.
- Responsibilities also include those defined by Senior PM role below.

Senior Project Manager (2005-2009)

- Responsible for initiation, execution, control, and closeout of project budgets and deliverables. Tasks include project estimate approval, accrual of all project expenses, control of all customer invoicing, and approval of all subcontract purchase orders.
- Implement key authorizations associated with project execution including but not limited to aerial acquisition, ground surveys, aerotriangulation, and orthophotography/LiDAR production.
- Manage all customer and subcontractor communication from project initiation through closeout.
- Business development support in the form of RFP reviews and technical writing.

The Omega Group, San Diego, CA, 2000-2005. The leading provider of innovative GIS desktop and Internet solutions designed to aid decision making in law enforcement, public safety, and education agencies.

Senior Project Manager (2001-2005)

- Instrumental with application sales, development, and marketing of desktop internet solutions, as well as analysis and management of information system projects.
- Development of turnkey enterprise solutions for public safety organizations including consulting, project management, installation, training and customer support.
- Technical competencies in network and systems management, IT operations, security strategies, database management, including web based environments.
- Directed clients in development of their customized applications consistently meeting or exceeding joint requirements of customer's specification in the project proposal.
- Developed and delivered informative sales presentations based on customer needs.
- Conducted installation and on-site training and provided technical support adhering to technical support agreement.

Professional Societies/Affiliates

Project Management Institute (PMI)

Publications

"Managing Storm Water Runoff", Earth Imaging Journal, July/Aug 2009, vol. 6, no. 4

Chronology

2012-Present: URS Corporation, Germantown, MD

2005-2012: Fugro EarthData, Inc., Frederick, MD
2000-2005: The Omega Group, San Diego, CA

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