

Port and Waterway Safety Assessment Louisville, Kentucky Workshop Report

Introduction

A Port and Waterway Safety Assessment (PAWSA) Workshop was conducted for Louisville, Kentucky, on February 12 – 13, 2002. This workshop report provides the following information:

- Brief description of the process used for the assessment
- List of participants
- Numerical results from the following activities:
 - Team Expertise
 - Waterway Risks Evaluation
 - Existing Waterway Mitigations Evaluation
 - VTM Tools Evaluation; and
- Summary of risks and mitigations discussion.

Strategies for reducing unmitigated risks will be the subject of a separate report.

Assessment Process

The PAWSA process is a structured approach to obtaining expert judgments on the level of waterway risk. The process also addresses the relative merits of specific types of Vessel Traffic Management (VTM) improvements for reducing risk in the waterway. The PAWSA process uses a select group of waterway user / stakeholders in each port / waterway to evaluate waterway risk factors and the effectiveness of various VTM improvements. The process requires the participation of local Coast Guard officials before and throughout the workshops. Thus the process is a joint effort involving waterway experts and the agencies / entities responsible for implementing selected risk mitigation measures.

This methodology employs a generic model of port risk that was conceptually developed by a National Dialog Group on port risk and then translated into computer algorithms by Potomac Management Group, Inc. In that model, risk is defined as the sum of the probability of a casualty and its consequences. Consequently, the model includes variables associated with both the causes and the effects of vessel casualties.

The first step in the process is for the participants to assess their expertise with respect to the six risk categories in the model. Those assessments are used to weight the experts' inputs during all subsequent steps. The second step is for the participants to discuss and then numerically evaluate the absolute risk level in the waterway using pre-defined qualitative risk descriptors. In the third step, the participants discuss and then evaluate the effectiveness of existing mitigation strategies in reducing risk. Next, the participants are asked to offer new ideas for further reducing risk, for those factors where risk is not well balanced with existing mitigations. Finally, the effectiveness of various vessel traffic management tools in reducing unmitigated risk is evaluated.

Participants

The following is a list of waterway users and stakeholders who participated in the process:

Participant	Organization	Phone	Email
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Participants (continued)

Facilitation Team	Organization	Phone	Email
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Geographic Area:

Scope of the port area under consideration: The participants defined the geographic bounds of the port area to be discussed.

- From 18 Mile Island (mile 584) to mile 630. Including:
 - Harrods Creek
 - VTS Louisville area of responsibility

Numerical Results:**Book 1 – Team Expertise**

In Book 1, the participants were asked to assess their level or expertise compared to the other participants in the workshop. They were asked to rate themselves as top one-third, middle third, or lower third with respect to the six categories in the Waterway Risk Model. For the most part, 1/3 of the participants placed themselves in the top third, 1/3 in the middle third, and 1/3 in the bottom third for each category. There were two exceptions: Vessel and Crew and Vessel Traffic. For these two categories, almost two thirds of the participants believed they fell into the top third with almost all of the balance placing themselves in the middle third.

Book 2 – Waterway Risks

Vessel & Crew	Vessel Traffic	Navigation Conditions	Waterway	Immediate Consequences	Subsequent Consequences
Seaworthiness 3.3	Commercial 2.5	Winds 2.0	Visibility Impediments 7.0	Injuries 9.0	Health and Safety 8.4
Mariner Proficiency 3.3	Recreational 5.3	Currents 4.9	Dimensions 5.4	Hazardous Discharge 3.1	Environment 3.3
Boater Proficiency 7.6	Traffic Mix 6.1	Visibility Restrictions 3.5	Bottom Type 4.5	Property Damage 3.7	Aquatic Resources 3.3
Significant Vessels 3.0	Congestion 4.1	Obstruction 4.1	Configuration 5.9	Port Impact 6.1	Economic 5.6

Analysis:

The participants evaluated the absolute risk level in the waterway by selecting a qualitative descriptor for each risk factor that best described conditions in the Louisville area. Those qualitative descriptors were converted to numerical values using a national risk measurement scale. On that scale, 1.0 represents low risk (Port Heaven) and 9.0 represents high risk (Port Hell), with 5.0 being the mid-risk value. In the Louisville area, 10 risk factors were scored above the mid-risk value. They were (in descending order):

- Injuries (Immediate Consequences) 9.0
- Health and Safety (Immediate Consequences) 8.5
- Boater Proficiency (Vessel & Crew) 7.6
- Visibility Impediments (Waterway) 7.1
- Port Impact (Immediate Consequences) 6.1
- Traffic Mix (Vessel Traffic) 6.0
- Configuration (Waterway) 6.0
- Economic (Subsequent Consequences) 5.6
- Dimensions (Waterway) 5.3
- Recreational (Vessel Traffic) 5.3

Book 3 – Mitigated Level of Risk

Vessel & Crew		Vessel Traffic		Navigation Conditions		Waterway		Immediate Consequences		Subsequent Consequences	
Seaworthiness		Commercial		Winds		Visibility Impediments		Injuries		Health and Safety	
3.3	2.6	2.5	1.9	2.0	1.6	7.0	5.5	9.0	6.9	8.4	6.9
OK		OK		OK		NO		ALERT		ALERT	
Mariner Proficiency		Recreational		Currents		Dimensions		Hazardous Discharge		Environmental	
3.3	2.6	5.3	4.3	4.9	4.5	5.4	3.4	3.1	3.1	3.3	2.4
ALERT		ALERT		ALERT		ALERT		ALERT		OK	
Boater Proficiency		Traffic Mix		Visibility Restrictions		Bottom Type		Property Damage		Aquatic Resources	
7.6	7.1	6.1	4.9	3.5	3.4	4.5	3.0	3.7	3.4	3.3	2.1
NO		ALERT		OK		ALERT		OK		OK	
Significant Vessels		Congestion		Obstructions		Configuration		Port Impact		Economic	
3.0	2.4	4.1	3.5	4.1	3.6	5.9	3.5	6.1	5.5	5.6	5.2
OK		ALERT		OK		ALERT		ALERT		ALERT	

KEY		Book 2	Absolute level of risk
Risk Factor		Book 3	Level of risk taking into account existing mitigations
		OK	Consensus (2/3 of participants) that risks were well balanced by existing mitigations
Book 2	Book 3	ALERT	No consensus that risks were adequately reduced by existing mitigations
ALERT		NO	Consensus that existing mitigations do NOT adequately reduce risk

Legend:

The tool listed is determined by the majority of participant teams as the effect of the existing mitigations on the absolute risks developed in Book Two. The chart above shows the risk factor and the Book 2 and 3 results. For each factor box, an **OK** shows consensus that risks were well

Legend: (continued)

balanced by existing mitigations. An **ALERT** indicates that there was consensus and the risks were NOT adequately reduced by the existing mitigations. A **NO** shows that there was no good consensus on whether existing mitigations adequately reduced the risk. Once a green OK was determined, that risk factor was considered balanced and not discussed further.

Analysis:

The participants examined all risk factors and applied existing mitigations for the Louisville area. For 9 risk factors, the participants were in consensus that risks were well balanced by existing mitigations. Consensus is defined as 2/3 of the participants being in agreement. In 2 risk factors, the participants were in consensus that risks were NOT adequately reduced by existing mitigations. For the other 13 risk factors, there was not good consensus on whether existing mitigations adequately reduced risk.

Book 4 – VTM Tool Effectiveness

Vessel & Crew		Vessel Traffic		Navigation Conditions		Waterway		Immediate Consequences		Subsequent Consequences	
Seaworthiness		Commercial		Winds		Visibility Impediments		Injuries		Health and Safety	
OK		OK		OK		RR	0.9	OTH	2.7	OTH	2.3
						8	ALERT	2		3	ALERT
Mariner Proficiency		Recreational		Currents		Dimensions		Hazardous Discharge		Environmental	
RR	0.4	RR	1.0	DI	0.8	OTH	1.1	OTH	0.7	OK	
12	ALERT	6	ALERT	9	ALERT	5		10			
Boater Proficiency		Traffic Mix		Visibility Restrictions		Bottom Type		Property Damage		Aquatic Resources	
RR	3.0	OTH	0.9	OK		AN	0.3	OK		OK	
1	ALERT	7	ALERT			14	ALERT				
Significant Vessels		Congestion		Obstructions		Configuration		Port Impact		Economic	
OK		OTH	0.4	OK		OTH	0.4	OTH	1.1	OTH	0.3
		11	ALERT			13	ALERT	4		15	

KEY		OK	Risk / Mitigations Balanced	DI	Improve Dynamic Navigation Info
Risk Factor		AN	Improve Aids to Navigation	VTIS	Vessel Traffic Information System
Tool	Risk Gap	CM	Improve Communications	VTS	Vessel Traffic System
Rank	ALERT	RR	Improve Rules & Regulations	OTH	Other – not a VTM solution
		SI	Improve Static Navigation Info		

Legend:

The tool listed is determined by the majority of participant teams as the best to narrow the Risk Gap. The Risk Gap is the perceived reduction in risk when using the tools determined by the participants. Rank is the position of the Risk Gap for a particular factor relative to the Risk Gap for the other factors as determined by the participants. An **ALERT** is given if no mathematical consensus is reached for the tool suggested.

Analysis:

The results shown are consistent with the risk discussion that occurred in this port. For 9 of the 14 risk factors for which there was good consensus, the participants judged the risk to be well balanced by existing mitigations already. The participants suggested VTM tools were appropriate for:

- Dimensions – OTH
- Injuries – OTH
- Hazardous Discharge – OTH
- Port Impact – OTH
- Economic – OTH

Ten consensus alerts occurred because votes were split between several VTM tools, as indicated:

- Mariner Proficiency – AN (2), CM (1), RR (7), VTIS (1), OTH (2)
- Boater Proficiency – RR (10), OTH (9)
- Recreational – CM (1), RR (8), OTH (8)
- Traffic Mix – AN (1), CM (2), RR (5), VTS (1), OTH (7)
- Congestion – AN (1), CM (2), RR (3), VTS (1), OTH (6)
- Currents – AN (1), SI (1), DI (6), VTIS (2), VTS (1), OTH (1)
- Visibility Impediments – AN (2), RR (5), VTS (1), OTH (5)
- Bottom Type – AN (2), SI (1), OTH (1)
- Configuration – VTIS (2), VTS (1), OTH (3)
- Health and Safety – CM (3), RR (1), VTIS (1), OTH (6)

RISKS	RISK MITIGATION STRATEGIES
Vessel and Crew: Seaworthiness	
<p>Today:</p> <ul style="list-style-type: none"> • Citations are issued to 180-200 recreational boats annually. 80% are for equipment violations such as inadequate fire extinguisher and life jackets. • On commercial vessels, most citations are issued for equipment problems. • Some towboats are not well maintained. This seems to occur with smaller/fleet companies. • Barges are beginning to show some age...Well seasoned! • As gasoline prices drop, the number of recreational boats on the water increases. • Trailered recreational boats seem to be less well maintained than larger boats that remain in the water. • Commercial vessels seem to be better maintained than recreational boats. <p>Trends:</p> <ul style="list-style-type: none"> • Local law enforcement stated that recreational boat maintenance is improving. • Recreational boating population continues to grow. • Commercial traffic is continuing to grow throughout the Western Rivers. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • AWO Responsible Carrier Program provides for better maintained vessels. • There appears to be a great deal of pride with some recreational boaters. • Local law enforcement stated that better than 90% of the recreational boats are materially sound; 80% have the required equipment. • Passenger vessels are CG inspected and manned by CG licensed mariners. • Towboats are very well maintained and the number of casualties is very low in comparison to amount of vessels on the water. Larger companies typically have better maintained vessels. • CG Auxiliary and U. S. Power Squadrons perform Courtesy Marine Examinations. State and local law enforcement agencies perform similar exams. • The CG performs Cooperative Towing Vessel Exams. • Some companies have their own audit program for towboats. • Tank barges are regularly inspected by CG. • Local law enforcement and the CG Auxiliary patrol the harbor. • Federal, State, and local laws are enforced on the water. • Federal standards for loading and construction have been applied to the recreational boats over the years. <p>New Ideas:</p> <ul style="list-style-type: none"> • CG Group Ohio Valley has established a Boating Safety Team that will use a 23-foot Safe Boat, to assist state and local officials with safe boating enforcement.

RISKS	RISK MITIGATION STRATEGIES
Vessel and Crew: Mariner Proficiency	
<p>Today:</p> <ul style="list-style-type: none"> • Operators of commercial vessels have different levels of experience, particularly in entering the Louisville and Portland Canal during high water and there is no substitute for experience at that time. <ul style="list-style-type: none"> ○ Head of Louisville and Portland Canal is one of the most dangerous areas for marine casualties on the Ohio River. ○ L & I Railroad Bridge is a trouble spot and causes an obstruction to navigation. • Four years experience is required for some candidates to qualify for a towboat license. <ul style="list-style-type: none"> ○ Candidates must have deck and steering time. ○ The real test for towboat captains is to run under the Louisville bridges and into the canal in high current. • Complacency is an issue and occurs when running the same route all the time where the operator can easily lose focus. • Handling characteristics are much different between empty and loaded barges. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Passenger boats: Very strong mitigation due to CG requirements. The crews know the boat and are comprised of mostly local people. They are CG licensed. • Commercial vessel operators are required to have a CG license. • Many operators attend the Seaman's Church Center Training, particularly in an advanced pilothouse simulator. This is required under American Waterway Operators (AWO) Responsible Carrier Program (RCP). Towboats operators routinely use the simulator. • Random drug testing is ongoing as required by regulations. • Some companies put a senior Captain on with less experienced operators. • There appears to be an increased level of professionalism in the commercial towing industry. <p>New ideas: See next page.</p>

RISKS	RISK MITIGATION STRATEGIES
Vessel and Crew: Mariner Proficiency (Continued)	
	<p>New ideas:</p> <ul style="list-style-type: none"> • Consider that CG implement licensing changes: <ul style="list-style-type: none"> ○ Put more focus on entry level training and performance. ○ Consider focus on currency of experience. ○ More focus on licensing and training process. • Consider a best practice such as: <ul style="list-style-type: none"> ○ Require better area familiarization. ○ Provide a standardized training and educational prerequisite to qualify to operate a recreational boat across the states. • Let economic competition weed out the non-performers. <ul style="list-style-type: none"> ○ Develop standard customer audits required by ISO and insurance companies.

RISKS	RISK MITIGATION STRATEGIES
Vessel and Crew: Boater Proficiency	
<p>Today:</p> <ul style="list-style-type: none"> • Recreational boaters have little if any safe boating knowledge. <ul style="list-style-type: none"> ○ Jet ski operators are 12 at the youngest. ○ Unqualified people can operate a boat or Jet Ski. ○ Operators of boats 20ft and less have horrible performance. ○ Recreational boaters generally don't know the rules of the road. ○ CG Auxiliary & Power Squadron education programs in this area experiencing declining participation. • Fishing and hunting boat operators not attentive to other vessels. • Generally speaking, large boats have trained operators and good equipment. • Alcohol use contributes to 90 % of boating accidents. <ul style="list-style-type: none"> ○ Twelve of the last thirteen boating fatalities in the area involved alcohol. ○ During special events, like Thunder Over Louisville, people boat for the first time of the season. This occurs during cold water and normally high water conditions. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Local recreational boater performance here considered good compared to inland lakes. • There are more strict laws on BWI. • Boating violators are being required to attend boater safety classes. • Power Squadron and CG Auxiliary offer boater education. • Need to be over 15 to operate a boat in Indiana. • Kentucky requires that teens ages 12 to 17 have a boating certificate, an adult or another person with a boating certificate with them in the boat. <ul style="list-style-type: none"> ○ Under age 12, Kentucky allows only the operation of under 10 HP vessel. • There is moderate degree of enforcement on the water. • Some Judges are requiring mandatory boater education upon conviction of a boating violation. <p>New ideas: See next page.</p>

RISKS	RISK MITIGATION STRATEGIES
Vessel and Crew: Boater Proficiency (continued)	
	<p>New ideas:</p> <ul style="list-style-type: none"> • Consider assigning points to drivers' licenses for boating violations – Indiana is implementing. • Consider licensing requirement for recreational boaters. <ul style="list-style-type: none"> ○ Consider increasing the minimum age to operate a recreational boat. • Work within the judicial system to require education for violations. • Approach the insurance industry to only insure boats with a qualified operator(s). • Consider having the state only issue a boat number when a boat is insured. • Consider increasing enforcement efforts. Group Ohio Valley plans to have a Boating Safety Strike Team operational by mid-summer 2002. • Consider piggy backing off drivers' licenses and marketing programs for boating certificates and safety programs.

RISKS	RISK MITIGATION STRATEGIES
Vessel and Crew: Significant Vessels	
<p>Today:</p> <ul style="list-style-type: none"> • LASH barges are brought up river from New Orleans (loaded foreign) and offloaded. • Petroleum and chemical barges come through the waterway. • High capacity passenger vessels transit the waterway. <ul style="list-style-type: none"> ○ Casino boats. ○ Dinner cruises. ○ Large visiting passenger vessels. • S/S Belle of Louisville is a historic, symbolic target. • Liquefied flammable gas (LFG) barges transit through this stretch of the river. • Barges that transport highly toxic chemicals, e.g., anhydrous ammonia, chlorine, benzene, transit the river. • Blocking, disabling McAlpine Locks and Dam would cripple the industry. There is no auxiliary chamber due to current construction operations. • Damage to the lock and dam structure would affect the community. This is a very highly vulnerable structure. • Ports are a potential terrorist target. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • The Ohio River has many miles of river from the nearest and only blue water port of entry to the Ohio River. • The Jones Act helps to mitigate. • There are double hull requirements for tank barges. • VTS system is operated during high water conditions. Exerts positive control over significant vessel operations. <p>New ideas:</p> <ul style="list-style-type: none"> • Consider allowing visual surveillance of the waterway by VTS watch standers (VTS does not have a window or video surveillance).

RISKS	RISK MITIGATION STRATEGIES
Vessel Traffic: Commercial	
<p>Today:</p> <ul style="list-style-type: none"> • An average fifteen tows transit through the McAlpine Locks per day. • This is a low risk factor. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • The Army Corps of Engineers (USACE) is making improvements to the locks to handle increased traffic. • Operators are able to lay up / tie off barges to mooring cells at Utica, 12 Mile, 6 Mile and Tow Head Islands. • Below the dam, there are many more places to lay up to the high banks. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Vessel Traffic: Recreational	
<p>Today:</p> <ul style="list-style-type: none"> • This factor is very seasonal: During the summer and particularly on the weekends. • Sailboats hold regattas in the area between Cox’s Park and 12 Mile Island. • Many recreational boats attend marine events. <ul style="list-style-type: none"> ○ In the upper pool between 12 Mile Island to Cox’s Park (by the Waterworks just north of Towhead Island) is the heaviest concentration. ○ Some recreational boats move through the McAlpine Locks. • Larger recreational boats are in the area along Grassy Flats, up river from 12 Mile Island. • Events at Louisville’s Waterfront Park draw recreational traffic into the bridge area. These can become a nuisance event. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Jefferson County River Patrol provides enforcement and SAR response. • There is deliberate planning for marine events. Marine event permitting system by the CG is in place and working. <ul style="list-style-type: none"> ○ Certain onshore events can be designated as a marine event. • Partnership between CG, USACE, and industry has been working for several years. They meet in the spring to plan and after large events to critique. This has been especially effective in solving problems near Louisville’s Waterfront Park. • There is a line of 5 buoys by Louisville’s waterfront park to show the channel to recreational boats. • It is illegal to stop and anchor in the navigation channel. • A river users advisory board with 13 members was started to get input from boaters and people living along the water. • There is a restricted area to keep recreational boaters out of the area between Second Street Bridge and the locks unless they are locking through. • Public outreach programs reach a portion of the boating public. • There are scheduled locking times for recreational boats at McAlpine Locks on the weekend. They do NOT lock through with commercial traffic. <p>New ideas:</p> <ul style="list-style-type: none"> • See also Traffic Mix • More enforcement equals less alcohol on the river!

RISKS	RISK MITIGATION STRATEGIES
Vessel Traffic: Traffic Mix	
<p>Today:</p> <ul style="list-style-type: none"> • Sailboats routinely have regattas on Wednesday and Sunday afternoons in the summer. • Conflicts between sailboats and tows reported at Limestone Bay Marina. It is upriver of 12 Mile Island on the Kentucky side. • Pleasure craft towing skiers cut in front of tows. • Islands and bridges obscure smaller boats. • Recreational boaters complain the lighting system on barges makes it hard to tell extent of tow. Can't tell what is what. • Recreational boats are restricted from going below the Second Street Bridge except to lock through McAlpine Locks. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Commercial operators stay within the navigation channel very well. • The Navigation Rules. <p>New ideas:</p> <ul style="list-style-type: none"> • Increase enforcement of safe boating. • Need to educate recreational boaters about maneuverability of tows. • Consider additional education on rules of the road and required relationships between vessels navigating on the river. • Consider education media spots. Consider using the radio to broadcast information. • Repaint the "Restricted Area" warning on bridge piers.

RISKS	RISK MITIGATION STRATEGIES
Vessel Traffic: Congestion	
<p>Today:</p> <ul style="list-style-type: none"> • At McAlpine Lock tows can safely pass one another in waiting areas. • Commercial vessels waiting to transit the McAlpine Locks have ample places to lay up. • Most of the recreational boats are above the locks. • Most of the commercial fishermen are below the locks. • Waterfront events with many recreational boats include: <ul style="list-style-type: none"> ○ Thunder Over Louisville, usually at time of high current and high water. ○ Friday night and Saturday concerts at Waterfront Park. ○ Fireworks displays. • Events are located from the Second Street Bridge upstream to a third of the distance to Towhead Island. • Sailing line. Tows hug the Kentucky side at Waterworks and follow it into the canal as required. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • CG marine event permitting system allows for planning and execution of river based events. • During the Thunder Over Louisville event: <ul style="list-style-type: none"> ○ There is a “no wake” requirement from lower end of 6 Mile Island to city front. ○ Great liaison between State and local law enforcement, CG, and other agencies. ○ Commercial traffic is restricted in transiting the area during the event. ○ VTS Louisville. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions: Winds	
<p>Today:</p> <ul style="list-style-type: none"> • Seasonal 20 mph wind occurs once a week or less. • Empty barges are more affected by wind and can safely operate in wind speeds of 20 mph or less. • S/S Belle of Louisville can safely operate in wind speeds of 20 mph or less. • Within the Louisville and Portland Canal, the bank blocks a portion of the wind. • Recreational boats, less than 20-foot long, ride very rough in 3-foot swells from sustained wind. 20 mph winds usually cause rough water. • During the spring there are higher winds and tornados do occur from time to time. • Winds pick up in the p.m. during summer, die at sunset. • Late September and October typically have higher winds. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Predictability is really good. Squalls are predicted with fronts moving through. • Weather is very predictable for this region, as fronts are easily tracked days in advance. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions: Currents	
<p>Today:</p> <ul style="list-style-type: none"> • When the McAlpine Dam gates are wide open at high water stage, the current is strong, about 5 mph. • Current is seasonal. During the summertime, the river is more like a lake. • The Louisville and Portland Canal is “still water.” • The current draws across the head of the vane dike toward the dam at the entrance to the Louisville and Portland Canal. • During low water, at the guide wall to the lock at the lower end, the current will draw underneath and will set vessels off the wall. • The river stage was 30+ feet during the 1997 flood. • When the river is 13 – 16 feet, it runs faster until it goes over the banks and still rises but the current reduces in speed. • There is a lot more driftwood with high water. • At high water, the current pushes toward Indiana in the vicinity of the Power Plant, and Sherman Minton Bridge. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • VTS goes into operation when the riverstage gets to 13 feet at the upper pool gauge. Keeps track of commercial vessels and manages the traffic flow. • Seaman’s Church has reproduced this section on their simulator for training purposes. • The river stage is monitored and broadcast twice a day by Group Ohio Valley. In addition, they post the river stages on its web site. • Rivermen have local knowledge of the currents. • Vane dike helps guide vessels into the canal. • Web site gives dynamic information. It includes the past 5 days plus a 3-day forecast. <p>New ideas:</p> <ul style="list-style-type: none"> • Make assist vessels available during periods of high water. • Provide better information about speed, location, and direction of current. • Widen the L & I railroad bridge horizontal clearance. • Cut off the up river part of Shippingport Island to allow a shallower turn when going downstream toward the locks. • Post dynamic information on the USACE web site and make it easily available to recreational boaters. • Discuss with local media about including river conditions in their forecast, especially during high water periods and marine events.

RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions: Visibility Restrictions	
<p>Today:</p> <ul style="list-style-type: none"> • Fog is seasonal, occurs spring and fall, particularly in September and October. Fog occurs most every morning and burns off by mid-day. • Fog forms more often above 6 Mile Island than below 6 Mile Island. • Fog forms in the lower pool, around Greenwood boat ramp (mile 618), and persists for several hours. • Fog averages about two days a month. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Larger vessels typically have radar. • Rules of the Road require: <ul style="list-style-type: none"> ○ Sound signals. ○ Lighting on vessels. ○ Posting lookouts. • Commercial vessels will pass information on visibility conditions via bridge-to-bridge radio. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Navigation Conditions: Obstructions	
<p>Today:</p> <ul style="list-style-type: none"> • If and when ice occurs, it is a real impediment to navigation. • There is a lot of floating debris during high water. <ul style="list-style-type: none"> ○ A tree stuck to the bottom recently claimed several recreational boat props and two shafts. • Heavy debris does not occur during stable water conditions. • There are presently several acres of debris at Markland Dam (outside of the geographic area of consideration). <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • There has been no substantial ice in the river since 1989. • Obstructions in navigable channels are removed by a myriad of people. Law enforcement boats will occasionally drag debris out of the channel. Towboats also will remove debris. • When river is high and producing a lot of debris, the recreational boats typically stay off the water. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Waterway: Visibility Impediments	
<p>Today:</p> <ul style="list-style-type: none"> • Chief complaint. Recreational boaters cannot see the barges coming at them at night. Even with added strobe, they cannot see the barges. • Towboat captains complain that they cannot see the lights on the recreational boats. • Background lighting: <ul style="list-style-type: none"> ○ City front lights at Great Lawn were blinding the operators who could not see bridge lights, if they were working, when down bound. • Unshielded lights in city area glare into operators' eyes. • When northbound out of the city front upstream from Jeff Boat, looking up the river, it takes awhile to get adjusted to a lack of light. • Between 6 and 12 Mile Islands, there is a house with red and green porch lights that look like a boat's navigation lights. • Bridge lights often are out. • Recreational boaters operating with cabin lights on. <p>Trends:</p> <ul style="list-style-type: none"> • Additional lighting as part of future waterfront expansion. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Bridges are not an impediment to visibility. • Bridge to bridge radio communications. • Radar. • Sound signals. • Required vessel lighting. • Great Lawn lights are either turned off or re-aimed away from the water. • Boating Safety courses are being conducted. In the spring, there will be a boating safety refresher training course. • When barges are nosed into the bank, their bow, red and green lights are inland with their stern exposed. At that time, the towboat operator lights the barge with searchlight to show where it is. • Follow all Navigation Rules! <p>New ideas:</p> <ul style="list-style-type: none"> • Consider outboard lights on each separate barge. This gives ability to judge depth of view and breadth of tow. • Consider low intensity lights at each barge coupling. (soft white glow...2' x 2' square backlit illuminated panel). • Provide additional enforcement of lighting requirements. • Add additional element to boating safety courses to better recognize light configurations. • Increase range of visibility for lights on recreational boats. • Shield or redirect shoreside lights from shining directly at or on the river.

RISKS	RISK MITIGATION STRATEGIES
Waterway: Dimensions	
<p>Today:</p> <ul style="list-style-type: none"> • Channel under L & I Railroad Bridge is 241 feet wide and right on the turn. • Opposing traffic can pass, slowly, in the Louisville and Portland Canal. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Bridge to bridge radio communications help manage the traffic. • Navigation Rules provide traffic guidance. • There is voluntary one-way traffic at Louisville Bridges, between vane dike through the locks and to the Sherman Minton Bridge. • VTS operates to manage traffic during high water. • USACE manages vessels in the queue for the locks. • ATON lights are on the L & I Railroad Bridge and show when it is open. • USACE advertises a 9-foot channel depth. <p>New ideas:</p> <ul style="list-style-type: none"> • Consider widening or replacing the L & I Railroad Bridge. • Consider a visual signal before the point of no return (Towhead Island) indicating the status of the L & I Railroad Bridge. • There was general agreement when the water level is above normal pool at least 80 feet clearance is needed under the L & I Railroad Bridge.

RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration: Bottom Type	
<p>Today:</p> <ul style="list-style-type: none"> • Rocks are in the channel between the vicinity of the Portland Bar and Sherman Minton Bridge; from the power plant to the locks. • When approaching the L & I Railroad Bridge, a towboat can get its stern into concrete on the Kentucky side. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • There is occasional dredging in lower approach to McAlpine Locks. • Most barges are loaded appropriately. • The USACE has a permitting and review process for construction projects on or near the river. • CORMIG – Central Ohio River Maritime Industry Group – has been chartered and is meeting. It is being used as a Harbor Safety Committee. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Waterway Configuration: Configuration	
<p>Today:</p> <ul style="list-style-type: none"> • The river bends while going into the Louisville and Portland Canal. • Harrods Creek intersection with Ohio River can be a problem area. • Sailboats cross river between 12 Mile to 6 Mile Island. • At Towhead Island, on the down stream side, recreational boats come out and converge into the main channel. • Blind areas are around 12 Mile Island, 6 Mile Island and at the Louisville and Portland Canal. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Bridge to bridge radio communications. • Local knowledge. • Aids to Navigation. • DGPS is a useful tool. • Charts show the river configuration. • Notice to Mariners advise of any maritime related changes. • USACE Notices to Navigation advise of projects. • River industry bulletin board is a web site that provides river related information. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences: Injuries	
<p>Today:</p> <ul style="list-style-type: none"> • Louisville has high volume of passenger vessels. Dinner cruises and gambling vessels use the river. <ul style="list-style-type: none"> ○ Gambling boat holds 5000 people. ○ S/S Belle of Louisville holds 1000 people. ○ Star of Louisville holds 300. ○ Spirit of Jefferson holds 300. • Floating restaurants in the bridge area, upstream of the revetment are close to the sailing line. • Delta Queen, American Queen, Mississippi Queen, and the River Barge Explorer occasionally visit Louisville and moor overnight. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Agencies have resources and practice by working together during special events. Agencies use common operating frequencies during events. • Harbor towboats in the area can help with rescues. There are usually three boats operating around Towhead Island to Jeff Boat. • The following are additional resources: • Harrods Creek Fire Department rescue. • Louisville Police and Fire Department. • Jefferson County – dive teams and HAZMAT teams. Also have EMS capability. • Fire departments – have platoon of people, 5-6 minute response times to an old CG 41-foot response boat. • Many people along the water to assist if needed. • CG Auxiliary has a fleet. • Several tow boats usually in the vicinity. • In the summertime expect immediate response time; in the wintertime expect one hour response time. • Local Emergency Planning Committees meet regularly. • The waterway is narrow, allowing rapid shore access. • Casino boats have disaster and response plans and hold full-scale drills once a year. • Group Ohio Valley has VHF-FM coverage of the area and an extensive database of emergency numbers / contacts. <p>New ideas: See next page.</p>

RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences: Injuries (Continued)	
	<p>New ideas:</p> <ul style="list-style-type: none"> • Establish communication plan that directs calls to appropriate response units. • Use a mutual aid frequency to get all agencies talking together. • Consider a plan that provides a call to the appropriate person in an emergency.
Immediate Consequences: Hazardous Discharge	
<p>Today:</p> <ul style="list-style-type: none"> • USACE statistics show 11% chemicals and 9 % petroleum, all moving in bulk on the river. • Styrene, chlorine, anhydrous ammonia, liquefied flammable gas, benzene chemicals transit the waterway. • The chemical and petroleum plants in lower pool get their material in and out via barge. • Barge size is typically 1500 tons at 9-foot draft. • A million and a quarter gallons of chemicals or petroleum are carried by each. • Marathon has a fleet service with 8-10 (at any time) barges loaded at mile 612.5, directly across from all the gas docks on the Indiana side. • Single skinned barges for chemical and petroleum products are still in use, but will be phased out in 2015. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • CG Auxiliary has one safety vessel with portable pumps and booms. • Industry carries emergency response equipment. • Environmental companies in the area. These are Oil Spill Response Organizations (OSROs). • Louisville and Jefferson County Fire Departments have response equipment. • Mutual aid group exists with response equipment. Mutual Aid Association does a response drill once a year – looks for volunteers. • All above are for both oil and hazmat. • County police met and developed risk assessment to identify major targets. Also discussed evacuation processes. They understand the issue of evacuating many people. • In October, there will be a HAZMAT conference in Louisville with a training session off Waterfront Park. • Group Ohio Valley has VHF-FM coverage of the area and an extensive database of emergency numbers / contacts. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences: Property Damage	
<p>Today:</p> <ul style="list-style-type: none"> • Damage to barge typically costs \$10 to \$15K. • Generally, the vessel is damaged due to a marine casualty. There is typically little damage to the object that was struck, e.g., mooring cell, and bridge fenders. • Any serious damage to the locks can start at a million dollars. • Casino boat (\$100M boat) was hit by a barge. • It costs \$275K for new hopper barge from Jeff Boat. Tank barges cost \$1.4M. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Protective cells are installed and protect vessel from doing more damage. • OSROS help to reduce property damage. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Immediate Consequences: Port Impact	
<p>Today:</p> <ul style="list-style-type: none"> • Sensitive / vulnerable assets. • Due to security concerns, a specific listing of sensitive / vulnerable assets cannot be provided. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Emergency bulkheads can be used to cut off the flow of water at the locks. • Miter gates for McAlpine Lock are stored and awaiting use. • USACE is currently conducting vulnerability assessments of the lock and dam. • No critical military assets in the Louisville waterfront area. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences: Health and Safety	
<p>Today:</p> <ul style="list-style-type: none"> • Over 100,000 people live near the waterway in the vicinity of Louisville and could be affected by a marine accident. • Chlorine barge casualty caused the evacuation of 60,000 – 80,000 people in 1972. • Kentucky drinking water comes from the river. Indiana has wells. 80% is coming from intakes at the Waterworks and up by Prospect Point (at mile 595). <p>Trends:</p> <ul style="list-style-type: none"> • None discussed 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Evacuation plans are in place. • There has been a test of the emergency warning system over PA systems on police cars. • In 1994, people were successfully evacuated from a chemical plant. • Jefferson County has a well trained and well equipped hazmat team. • All agencies and organizations continue to learn from experience. • Use the 1997 floods as example of moving people due to flooding waters. • Tank barges are now safer due to construction and carriage requirements. • Water company is converting from river water intakes to drawing from wells through the aquifer. • Ohio River Valley Water Sanitation Commission (ORSANCO) monitors water pollution for the public utilities on the Ohio River. <p>New ideas:</p> <ul style="list-style-type: none"> • Need to test evacuation plans.

RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences: Environmental	
<p>Today:</p> <ul style="list-style-type: none"> • Fossil beds are below the McAlpine Dam on the Indiana side. • Known mussel beds are above the dam on the Indiana side. • Mussel beds are along the Indiana shore between mile 609 to 617. • The area is considered a middle ground in environmental sensitivity compared to other areas along the Mississippi. • The areas are generally more sensitive where people frequent, and not so sensitive in remote areas. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Mitigations listed above under Hazardous Discharge. • Permitting process is in place. • Double skinned barges are used by most operators for hauling chemical and petroleum. Most local operators have already completed this conversion. • Spill response plans are in place and exercised with drills. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Subsequent Consequences: Aquatic Resources	
<p>Today:</p> <ul style="list-style-type: none"> • Commercial fishing is for catfish and sturgeon, around Clarksville, and fishing the lower pool along the Indiana / Kentucky border. Targeting 4-5 other species also. Seems to be fairly minor operation. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Fish status is monitored by ORSANCO and state agencies. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences: Economic	
<p>Today:</p> <ul style="list-style-type: none"> • Most casualties will affect local community. • Halting coal shipment will affect region. • Stopping gasoline supply will affect region. • Barges must deliver raw materials to plants up and down the river...steel, chemicals, and coal. Most plants have a 48 hour inventory. • Shutting down the M/V Glory of Rome, gambling boat will cost money. 31K people visit the ship per day and, on average, leave \$80 per person. • Tow tied up costs \$400 per hour. Total cost for delayed tows can be \$3.5 million per day. • 1993 was the last lock breakdown. Traffic moved through the smaller auxiliary lock. • In a recent 48-hour closure, the lock had a backup of 24 tows. • Over the last couple of years, when locks are shut down, 2-3 day closures is average length of shutdown. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Alternate, but very limited modes of cargo transport. <ul style="list-style-type: none"> ○ To trucks and railroad cars. ○ To pipeline systems for liquid cargo. • Capacity of 15-barge tow is equal to 840 highway trucks. • Although there are alternatives to moving cargo via barge, such as truck and rail, these alternatives will offer little relief to the economic impact. Highway and rail simply cannot handle the volume, and at the same economy to scale, that barges offer. In addition, there is little to no slack or excess capacity of truck or rail capabilities...these transportation systems are already at or near capacity. • Risk exposure from using trucks and railroad cars. • No mitigation for possible massive loss of jobs. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.