



# Michigan Department of Environmental Quality

## Operator Training and Certification Unit

### Vulnerability Analysis Workshop for Water and Wastewater Facilities





# **Michigan Department of Environmental Quality**

**Operator Training and Certification Unit**

**Vulnerability Analysis Workshop**

**for**

**Water and Wastewater Facilities**

**BOB BABCOCK  
EARL WUESTNICK**



# Operator Training and Certification Unit

**Bob Babcock**

**Renee Arntz**

## **Wastewater**

**Earl Wuestnick**

**Dan Holmquist**

**Bruce Lack**

## **Drinking Water**

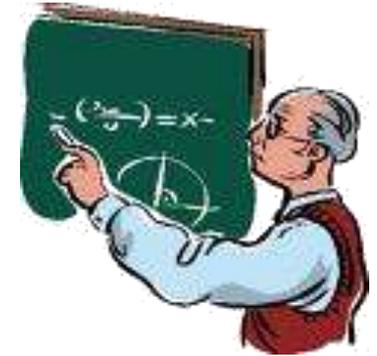
**Laura Chuhran**

**Matt Tomlinson**

**Paul Brun Del Re**

**John Koenigsknecht**

## TRAINING



- **ACTIVATED SLUDGE**
- **OXIDATION DITCHES**
- **SEQUENCING BATCH REACTORS**
- **ATTACHED GROWTH**
- **WASTE STABILIZATION LAGOONS**
- **INDUSTRIAL ( I & II)**
- **ANAEROBIC DIGESTION**
- **PHOSPHORUS REMOVAL**
- **LABORATORY (I, II, III)**
- **LABORATORY QA/QC**
- **BIOSOLIDS APPLICATION WORKSHOPS**
- **VULNERABILITY ANALYSIS WORKSHOP**



## CERTIFICATION

### MUNICIPAL

A, B, C, D, L1, L2, SC  
May Each Year



### INDUSTRIAL

29 Classifications (By Process)  
November Each Year



Storm Water Management\*  
(Construction and Industrial)  
Concentrated Animal Feed Operations\*  
(CAFO)

# Operator Training and Certification Unit -Wastewater

## TECHNICAL ASSISTANCE



### Plant Operations

SHIFT RELIEF SHEET  
Example: WWTP  
November 2005

Shift	Operator	Start	End	Notes
1	...	...	...	...
2	...	...	...	...
3	...	...	...	...
4	...	...	...	...
5	...	...	...	...
6	...	...	...	...
7	...	...	...	...
8	...	...	...	...
9	...	...	...	...
10	...	...	...	...
11	...	...	...	...
12	...	...	...	...
13	...	...	...	...
14	...	...	...	...
15	...	...	...	...
16	...	...	...	...
17	...	...	...	...
18	...	...	...	...
19	...	...	...	...
20	...	...	...	...
21	...	...	...	...
22	...	...	...	...
23	...	...	...	...
24	...	...	...	...



### Laboratory



Using Regression Function To Calculate Concentrations Given Data for Calibration Curve

Flow Control Valve	APC	MSD (mg/L)
0.05	0.001	0.001
0.10	0.002	0.002
0.15	0.003	0.003
0.20	0.004	0.004
0.25	0.005	0.005
0.30	0.006	0.006

Parameter	Example WWTP
Flow Control Valve	0.15000
Flow Control	0.001
Method	Ascorbic Acid
Wavelength	680 nm
Curve No	0.0
Analyst	S. H.

Parameter	Flow Control Valve	Concentration (mg/L)
0.150	0.001	0.001
0.150	0.002	0.002
0.150	0.003	0.003
0.150	0.004	0.004
0.150	0.005	0.005
0.150	0.006	0.006

DEQ

Slope: 0.0101  
Y-intercept: 0.0001  
Correlation: 0.9999  
Curvature: 0.0000

The total phosphorus results are calculated using the following formula:  $y = 0.0101x + 0.0001$

# Operator Training and Certification Unit

**For More Information**  
**Training Schedules**  
**Certification Schedules**  
**Certification Requirements**  
**Certification Renewal**  
**Continuing Education Credits**  
**ETC.**

[www.michigan.gov/deqoperatortraining](http://www.michigan.gov/deqoperatortraining)

**News and Events**[Bulletins & Newsletters](#)[Calendar](#)[Press Releases](#)[Citizen Involvement](#)**Training and Workshops**[Operator Training & Certification](#)[Other Training Opportunities](#)**About the DEQ**[Air](#)[Climate Change](#)[Key Topics](#)[Land](#)[Pollution Prevention](#)[Waste](#)[Water](#)**Operator Training and Certifications****Operator Training and Certification with Staff Contact List**

The Operator Training & Certification Unit would like to welcome you to its Home Page. The Unit provides rules and regulations, technical assistance, training and certification for Drinking Water and Wastewater System Operators. Whether you are new to the industry or you are a veteran Operator, this web site can answer many of your questions.

[More](#)**Information**

- [NEW Operator Certification & Training Fees Fact Sheet](#) PDF
- [Certification Boards](#)
- [Drinking Water and Wastewater Training Manuals & Materials](#)
- [Check Your Drinking Water CECs Online](#)
- [List of Approved Courses for CECs](#)
- [Participant Roster for Drinking Water](#) DOC
- [Approval of Programs for Continuing Education Credit-CEC](#)

**Drinking Water**

- [Drinking Water Operator Certification](#)
- [Exam Applications and Study Guides](#)
- [Training Courses and Continuing Education Credit Information](#)

**Wastewater**

- [Certification Renewal Applications](#)
- [Lists of Current Certified Operators](#)
- [Wastewater Operator Training Classes](#)
- [Industrial/Commercial Wastewater Treatment Plant Operator Certification](#)
- [Municipal Wastewater Treatment Plant Operator Certification](#)
- [Storm Water Operator Certification](#)

# MDEQ - OTCU

[www.michigan.gov/deqoperatortraining](http://www.michigan.gov/deqoperatortraining)

(517) 373-4753 (Dan H.)

(517) 373-4754 (Earl W.)

or

(517) 373-4755 (Bruce Lack)

# Course Details

## Facilities



## Schedule



## Breaks

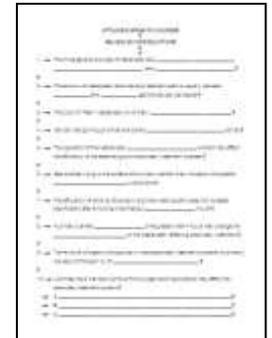


## Meals



## Manual

## Handouts



## Atmosphere

Relaxed  
Informal  
Questions Welcomed



# INTRODUCTION

# Water Sector

- The Water Sector is one of 18 sectors of the National Response Framework
- Drinking water and Wastewater systems are included in the Water Sector

# All-Hazards Risk Management



# THE PROBLEM

# Kevin Morley, AWWA Security and Preparedness Program Mgr 3/8/12 email

- I am happy to announce that both the J100 and G430 standards have been granted SAFETY Act designation by the Department of Homeland Security. This is a very important milestone for the water sector and yet again marks our sector as a leader in the homeland security mission, much like the good work associated with the WARN initiative.

## **Utility Alert**

- **TO: AWWA Member Utilities**
- **FROM: AWWA Public Affairs**
- **DATE: March 5, 2012**
- The American Water Works Association has announced that the J100-10 and G430-09 Standards have been awarded SAFETY Act designation by the U.S. Department of Homeland Security. The designation carries important liability protection for the Association and for utilities which properly implement these standards.

# Case Study: SAFETY Act

Following the 1993 World Trade Center bombing and the 9/11 attacks, the private sector threatened the removal of their anti-terrorism technologies and services from homeland security related deployments due to the extraordinary large liability exposure

After the attacks of September 11, 2001, Congress enacted the Homeland Security Act of 2002

It included the Support Anti-terrorism by Fostering Effective Technologies Act of 2002 (“SAFETY Act”) – [www.safetyact.gov](http://www.safetyact.gov)



# The Point

- **Water Sector Security & Preparedness Standards.**
- **As utilities, liabilities may dictate that you need to demonstrate your due diligence in providing for the security for your system.**

# PREPARATION

# Water Sector Security Standards

- **The following 3 standards provide methods for demonstrating your utilities diligence.**
- **Aside from protecting your system and people, in the event of an incident, you can cite your efforts in meeting the drinking water industry standards (below)**

# Water Sector Security Standards

- ANSI/AWWA G430-09: Security Practices for Operation and Management
- b. • ANSI/ASME-ITI/AWWA J100-10 Risk Analysis and Management for Critical Asset Protection (RAMCAP®) Standard for Risk and Resilience Management of Water and Wastewater Systems
- c. • ANSI/AWWA G440-11: Emergency Preparedness Practices
- More information about these 3 standards can be found at this web site:
- <http://www.awwa.org/files/Education/WebCasts/2012Webcasts/W1223WaterSectorSecurity032112/W1223Presentation.pdf>

# Case Study: SAFETY Act

- World Trade Center bombing in February 1993
- Port Authority of New York and New Jersey sued by over 500+ plaintiffs for over \$100,000,000 in damages
- Court found the Port Authority over 65% liable and the terrorists 35% liable

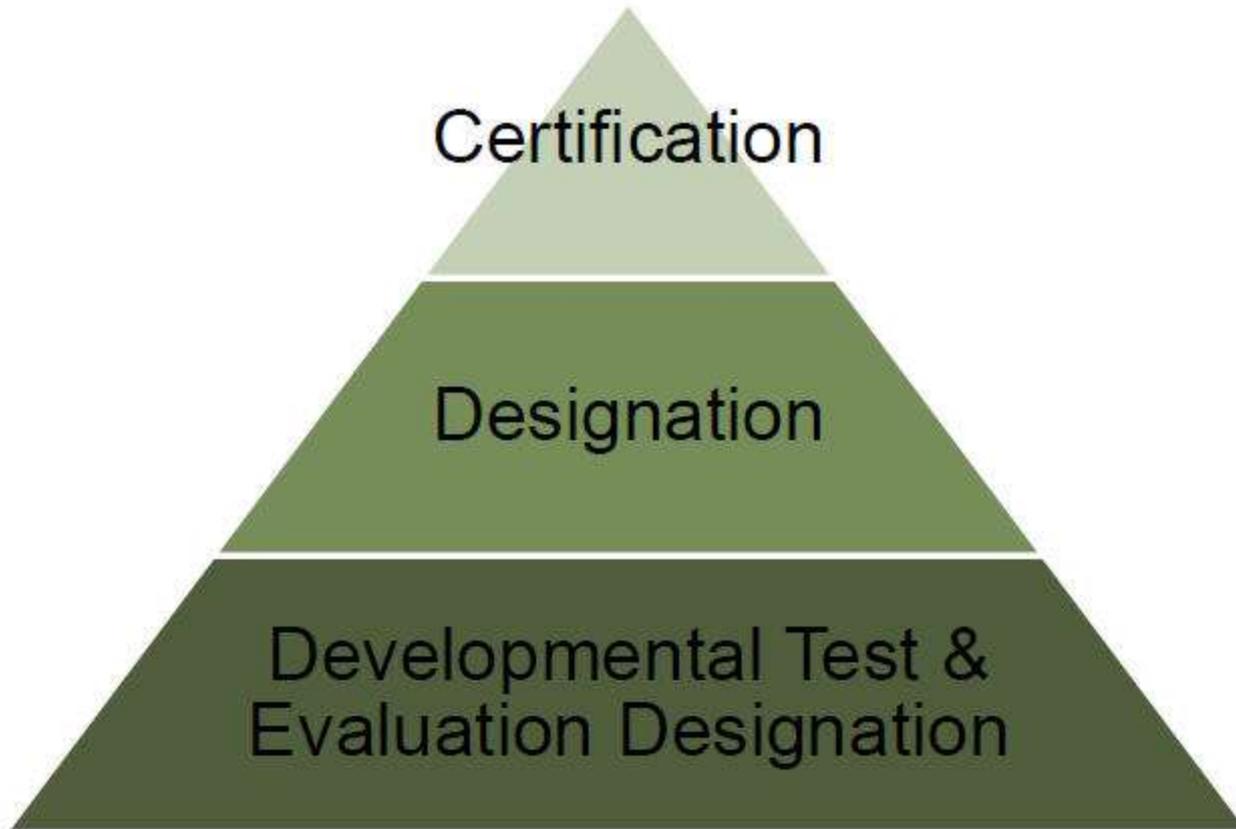


Why?

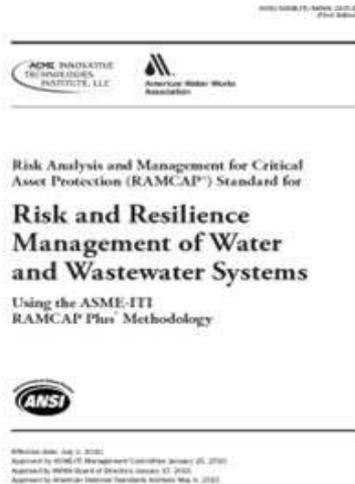


# SAFETY Act: Levels of Protection

The SAFETY Act incentivizes the deployment of effective anti-terrorism technologies and services by providing liability protections



# J100-10: Risk Analysis and Management for Critical Asset Protection (RAMCAP®)



**ANSI/ASME-ITI/AWWA J100-10: Risk  
Analysis and Management for Critical  
Asset Protection (RAMCAP®) Standard  
for Risk and Resilience  
Management of Water and Wastewater  
Systems**

# **J100-10: Risk Analysis and Management for Critical Asset Protection (RAMCAP®)**

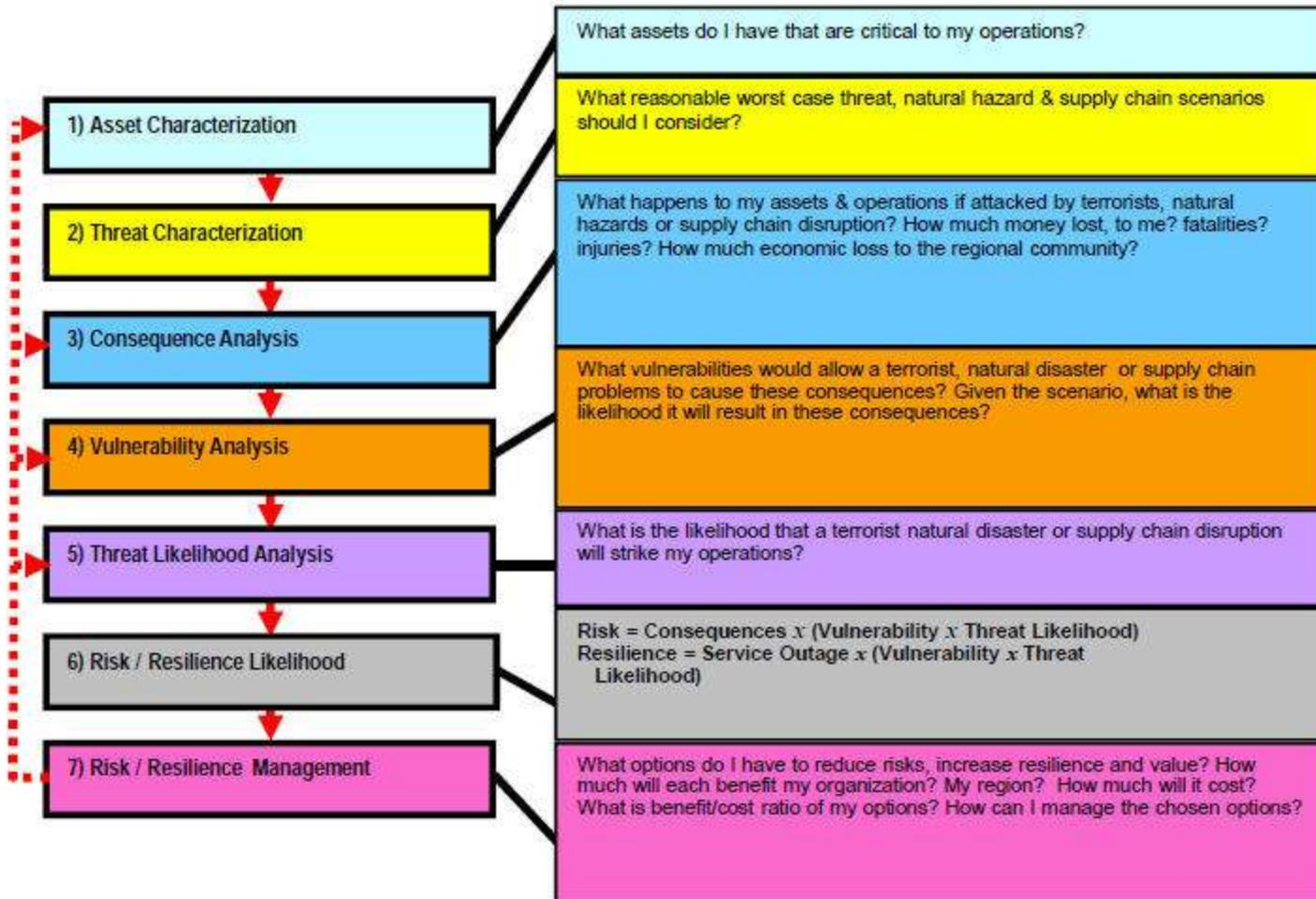
- This standard sets the requirements for all-hazards risk and resilience analysis and
- management for the water sector and prescribes methods that can be used for addressing these
- requirements. The standard documents a process for identifying vulnerabilities to man-made threats,
- natural hazards, and dependencies and proximity to hazardous sites and provides methods to
- evaluate the options for improving these weaknesses in water and wastewater utilities.

# J100 = Consistency and Comparability

- A uniform risk/resilience analysis methodology that provides
  - Common terminology
  - Common metrics
  - Common process
  - Common scenarios
  - Consistent results

Necessary for prioritizing and supporting resource allocation
- The RAMCAP process is not intended to be the most comprehensive and detailed risk assessment methodology – but it is intended to be
  - Practical and efficient to apply,
  - Cumulative over time, and
  - Effective in enhancing security and resilience

# J100-10





# Emergency Management



- **What are the phases of Emergency Management?**
  - **Disasters** do not just suddenly appear one day, but instead they have a life cycle. Realizing this, emergency management matches the disaster life cycle with a series of phases that include strategies to **mitigate** the hazards, **prepare** for and **respond** to emergencies and to finally **recover** from their effects.
  - These four phases are not independent, but instead are integrated with each other phase in a continual evolution.
-

# Emergency Management



- **Mitigation** *refers to activities which actually eliminate or reduce the chance of occurrence or the effects of a disaster.*
- Examples include reinforcement of a roof to reduce structural damage from high winds, preventing use of hazardous areas such as flood plains, or adjusting the use of such areas by elevating structures to reduce the chance of flooded houses.

# Emergency Management



- **Preparation** *is planning how to respond in case an emergency or disaster occurs and working to increase resources available to respond effectively to the disaster. Preparation activities are designed to help save lives and to reduce property damage by preparing people to respond appropriately when an emergency is imminent.*
  - The development of the city emergency operations plan is a preparation activity, just as assembling an individual disaster kit.
-

# Emergency Management



- **Response** activities occur during and immediately following a disaster.
    - They are designed to provide emergency assistance to victims of the event and reduce the likelihood of secondary damage.
  - Police, fire and rescue services are the primary responders during the response phase.
-

# Emergency Management



- **Recovery** is the final phase of the emergency management cycle. Recovery continues until all systems return to normal, or near normal.
    - **Short-term recovery** returns vital life support systems to minimum operating standards.
    - **Long-term recovery** from a disaster may go on for years until the entire disaster area is completely redeveloped, either as it was in the past or for entirely new purposes that are less disaster-prone.
  - Relocation of portions of a flood-prone town and turning the area into an open space or parkland is a recovery example. Recovery planning should include a review of ways to avoid future emergencies
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# Variety of Disasters

- Disaster come in many forms:

- Natural

- Weather
    - Earth
    - Fire



- Manmade

- Terrorist



# Natural Disasters



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# Manmade Disasters



# Terrorist Caused Disasters

**Terrorism**



# Areas of Concern



mk3650 www.fotosearch.com



# Areas of Concern



Credit: Alan Cressler



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# ■ LEGAL HISTORY

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# Federal Laws & Directives Wastewater Security

- Federal Law does not address wastewater as comprehensively as drinking water.

1. No vulnerability assessment required



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# Clean Air Act

- Requires wastewater facilities using more than 2500 lbs of chlorine to submit RMP to the EPA. Lays out accident prevention & emergency response activities.



# Clean Air Act Section 112(r)(1)

## General Duty Clause



- The [General Duty Clause](#) applies to **any** stationary source producing, processing, handling, or storing regulated substances or other extremely hazardous substances (EHS). Extremely hazardous substances are any chemical listed in 40 CFR Part 68, or any other chemical which may as a result of short-term exposures because of releases to the air cause death, injury or property damage due to their toxicity, reactivity, flammability, volatility or corrosivity.

# Clean Air Act Section 112(r)(1) General Duty Clause



- knowing the hazards posed by the chemicals and assess the impacts of possible releases;
- following codes, standards and other business practices to ensure the facility is properly constructed and maintained - and the chemical is managed safely; and
- having a contingency planning process, which would involve community responders, if necessary, to aid in an adequate response in the event of an accident.

# Homeland Security Presidential Directive 7



- Designates EPA lead agency to oversee security of water sector as the Sector Specific Agency.( Water & WW)
  1. Identify, prioritize & coordinate infrastructure protection.
  2. Facilitate vulnerability assessments.
  3. Encourage risk management strategies to protect & mitigate potential attacks.
  4. Develop mechanisms for information sharing.

# HSPD 7



- There are a number of federal statutes passed by Congress and signed into law by the President that are central to the Office of Water's mission.
- In addition, **Presidential Executive Orders** (EOs) play a central role in a number of Office of Water activities. EOs are legally binding orders that direct EPA and other federal agencies in their execution of Congressionally established laws and policies.

# Safe Drinking Water Act



- EPA implements standards and oversees states implementation.
  
  - Amended under Bioterrorism Act 2002
    - Drinking water systems over 3300 people conduct VA's for terrorism & intentional acts.
    - Act stops short of mandating utilities to implement improvements outlined in VA's.
-

# Safe Drinking Water Act



- EPA required to furnish info on potential threats.
  - EPA authorized to protect public health in event of threat or potential terrorist attack.
  - Tampering fine \$1,000,000 and/or 20yrs
  - Attempted threats \$100,000 and/or 3yrs
  - No Va's for Wastewater and no legislation passed for WW.
-

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# Homeland Security Act 2002

- Establishment of DHS.  **Homeland Security**
  - Improves coordination of security forces (23 agencies).
  - Assesses vulnerability of critical infrastructure.
  - Identifies protective measures and priorities.
-

# Safety Act 2002

- Promotes antiterrorist technologies to protect infrastructure targets.
- Protects vendors from law suits if technology fails.



# Patriot Act 2001



- Provides appropriate tools to intercept & obstruct terrorism on our critical infrastructure.
- “those systems and assets, whether physical or virtual, so vital to the U.S. that incapacity or destruction of such systems or assets would have debilitating impact on security, national economy, public health or safety.”

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# Critical Infrastructure Information Act 2002

- Protect critical infrastructure information that is voluntarily submitted to DHS.
- Protects information in VA's from unauthorized disclosure.



# Presidential Directives

## HPSD



- Homeland Presidential Security Directives
- Carries “full force and effect of law”
- Establishes new policy.



# HPSD -5



- Issues management of large scale emergency responses.
  
- Purpose of this act is to develop an comprehensive national approach for emergency management (Prevention, Preparedness, Response, Recovery & Recovery phases).
  - ❑ Single incident may affect multiple infra- structures.
  - ❑ Scale of incident may exceed capacity of response.
  - ❑ Response agencies have different organization & structure.
  - ❑ Coordination planning is lacking.
  - ❑ Communications between agencies incompatible/inadequate.
  - ❑ Agencies use different terminology.



# HSPD 5



- The goal is that all levels of government and the private sector work together in a response to an emergency.
  
- NIMS(National Incident Management System)
  
- NRF ( National Response Framework)
  - Provides template for management of incidents.

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# HSPD 7

## National Infrastructure Protection

- NIPP
- EPA take lead role in Water & Wastewater
- EPA works with states, local governments, AWWA & WEF to facilitate VA's & risk management strategies.



# HSPD 7



- Establish a national policy for federal departments to identify critical infrastructure and key resources of the U.S. in order to protect them from terrorist attacks.
-

# HSPD 8



- National preparedness develop policies to prevent & respond to threatened or actual domestic terrorist attacks. Major disasters & emergencies by establishing a mechanism for delivery of federal preparedness assistance to state & local governments.



# HSPD 8

- Includes plans, procedures, training & equipment to prevent, respond and recover from major events.
- Key to HSPD 8 is collaboration of mutual aid agreements and assistance compacts. For water its WARN (Water & WW Agency Response Network)



# WARN

- [www.miwarn.org](http://www.miwarn.org)
- Composed of 8 regions



k1896160 www.fotosearch.com



# MI WARN Regions

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April 2006 (3)



January 2008 (20)



March 2012 (48)



# EPA WARN Program



# Regulatory Framework

Protection

VULNERABILITY  
ASSESSMENTS



CRITICAL  
INFRASTRUCTURE  
PROTECTION PLANS

Response

EMERGENCY  
RESPONSE  
PLANS



MUTUAL AID  
AGREEMENTS

CONSEQUENCE  
MANAGEMENT PLANS

Recovery

CONTINUITY  
OF GOVERNMENT  
PLANS



CONTINUITY  
OF OPERATIONS  
PLANS

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# HSPD 9 (2004)

- Defense of U.S. agriculture and food system from terrorist attacks, major disasters and emergencies.



- EPA required to ensure water quality through surveillance and monitoring initiatives.



# HSPD 9

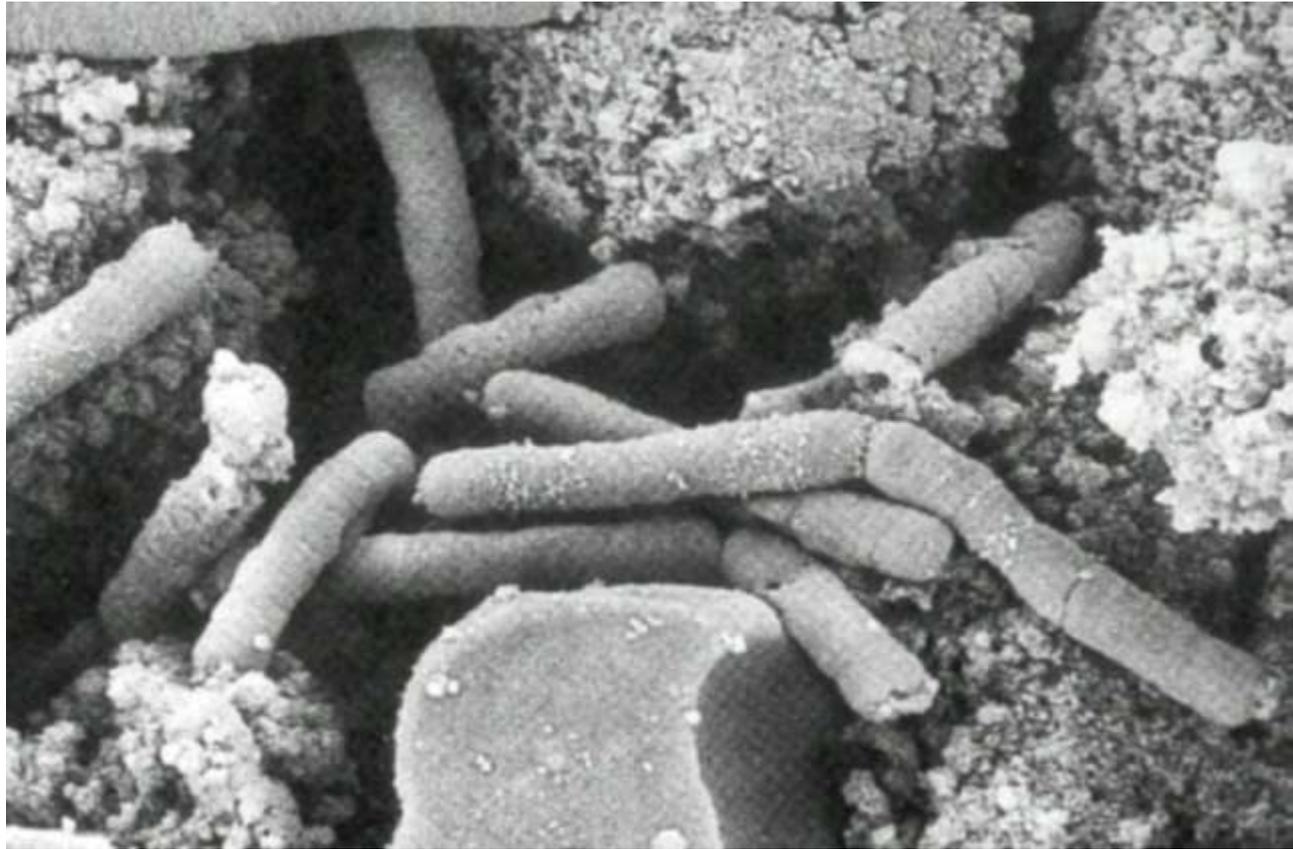


- Monitoring program by EPA to provide early warning for biological, chemical & radiological contaminants.
- WSI (Water Security Initiative) Demo project to design, deploy and evaluate model contamination warning systems for water utilities.





[www.Primatid.com.au](http://www.Primatid.com.au)



# HSPD 10

## Bioterrorism



- Protecting our critical infrastructure from the effects of biological weapons attacks is a priority.
  - A biological weapons attack might deny us access to essential facilities and response capabilities.
  - Therefore, we are working to improve the survivability and ensure the continuity and restoration of operations of critical infrastructure sectors following biological weapons attacks.
  - Assessing the vulnerability of this infrastructure, particularly the medical, public health, food, water, energy, agricultural, and transportation sectors, is the focus of current efforts.
  - The Department of Homeland Security, in coordination with other appropriate Federal departments and agencies, leads these efforts, which include developing and deploying biodetection technologies and decontamination methodologies.
-

# Bioterrorism Act



## 8 Requirements of Bioterrorism Act

### 8 Security Items your security program should consider under the Bioterrorism Act of 2002:

- (1) the purchase and installation of equipment for detection of intruders;
- (2) the purchase and installation of fencing, gating, lighting, or security cameras;
- (3) the tamper-proofing of manhole covers, fire hydrants, and valve boxes;
- (4) the rekeying of doors and locks;
- (5) improvements to electronic, computer, or other automated systems and remote security systems;
- (6) participation in training programs, and the purchase of training manuals and guidance materials, relating to security against terrorist attacks;
- (7) improvements in the use, storage, or handling of various chemicals; and
- (8) security screening of employees or contractor support services.

# HSPD 10

- Classified directive.
- Coordinate community, national security, medical, public health, intelligence departments, law enforcement and EPA into focused national effort against biological weapons threats.
  - Threat awareness
  - Preparation & protection
  - Surveillance & detection
  - Response & recovery



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# Chemical Facility Anti-Terrorism Standards

- Water & wastewater facilities are exempt from CFATS.
- DHS is pressuring for removal of this exemption from the rules currently.
- Chlorine gas is the chemical of interest. Release threshold of 2000 lbs and a theft threshold of 500 lbs.



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- Michigan  
Wastewater  
Authority

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# Michigan WWTP ERP Requirements



k8939817 www.fotosearch.com



bxp39717 www.fotosearch.com



k1896160 www.fotosearch.com

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# Wastewater System local emergency planning process

- Wastewater officials need to be a part of the community police, fire, and hospital emergency response activities associated with the local emergency planning.



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# Due diligence

- the care that a reasonable person exercises to avoid harm to other persons or their property



# Due diligence



- In criminal law, due diligence is the only available defense to a crime that is one of strict liability.
  - Once the criminal offence is proven, the defendant must prove on balance that they did everything possible to prevent the act from happening. It is not enough that they took the normal standard of care in their industry - **they must show that they took every reasonable precaution.**
-

# NPDES



- **Subpart B—Emergency Planning**
- **Who Must Comply**
- **§ 355.10 Must my facility comply with the emergency planning requirements of this subpart?**
- You must comply with the emergency planning requirements in this subpart if your facility meets either of the following two conditions:
  - (a) Any extremely hazardous substance (EHS) is present at your facility in an amount equal to or greater than its threshold planning quantity (TPQ), or
  - (b) Your facility has been designated for emergency planning purposes, after public notice and opportunity for comment, by one of the following three entities:
    - (1) The State Emergency Response Commission (SERC).
    - (2) The Governor of the State in which your facility is located.
    - (3) The Chief Executive Officer of the Tribe for the Indian Tribe under whose jurisdiction your facility is located.

# NPDES



- WWTP Requirements
  - O & M Manual
  - Worker Safety
  - Right to Know



# NPDES O & M Manual

## R 323.2218



- III. A description of the appropriate response or facility adjustment to minimize the impact of emergency situations with the potential to affect the discharge or compliance with the permit so as to facilitate rapid implementation of a correct response during an emergency
  - A. Measures to minimize upsets of the treatment system – discussion of common operating problems and corrective measures
    - 1. Containment provisions to prevent the accidental losses of polluting materials
    - 2. Inclement weather
      - a) Site access
      - b) Eliminating (e.g. insulate water lines) or minimizing effects of let-run conditions
  - B. Corrective Action and Reporting for Public Systems
    - 1. Facility breakdown or emergency resulting in discharge of excessive pollutants
      - a) Notification to Water Bureau (WB) District office
    - b) Written report to WB District office within 72 hours outlining the cause and corrective actions

# NPDES O & M Manual

## R 323.2218



- (ii) A description of the appropriate response or facility adjustment to minimize the impact of emergency situations with the potential to affect the discharge or compliance with the permit so as to facilitate rapid implementation of a correct response during an emergency.
-

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# MIOSHA Act 154



- An employer shall: (General Duty Clause)
    - ❑ (a) Furnish to each employee, employment and a place of employment which is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to the employee.
    - ❑ (v) Any other criteria deemed applicable by the standards promulgating commission.
-

# MIOSA General Duty Clause



- The **General Duty Clause** has an important use for workers. Sometimes there is a hazard, but OSHA has no specific rule or standard dealing with it.
- Under the **General Duty Clause**, the employer has an obligation to protect workers from serious and recognized workplace hazards even where there is no standard.
- Employers must take whatever abatement actions are feasible to eliminate these hazards. If an employer fails to do this, OSHA can inspect and issue a citation under the **General Duty Clause**.

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# Michigan Emergency Management Act (Act 390)

The [Michigan Emergency Management Act](#) (Act 390) provides for planning, mitigation, response, and recovery from natural and human-made disasters within the state.

- ❑ It requires the state to develop an emergency response plan, and counties and large municipalities to develop an emergency operations plan.
  - ❑ LEPCs must coordinate their off-site emergency response plans with the county/city emergency operations plan.
-

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# NREPA Part 41 Sewerage Systems...Sec 324.4108

- (1) The department shall exercise **due care** to see that sewerage systems are properly planned, constructed, and operated to **prevent unlawful pollution** of the streams, lakes, and other water resources of the state.



# NREPA: Rule 59 Emergencies

- Rule 59. (1) If a breakdown of a sewerage system or system component or any emergency situation results in the diversion from or bypass of facilities necessary for the effective collection, transportation, or treatment of the wastes and in the discharge of pollutants in excess of those authorized by a discharge permit issued by the department under the act, then the system owner shall **take all necessary measures to correct the breakdown or emergency** and eliminate or reduce the discharge of excessive pollutants.



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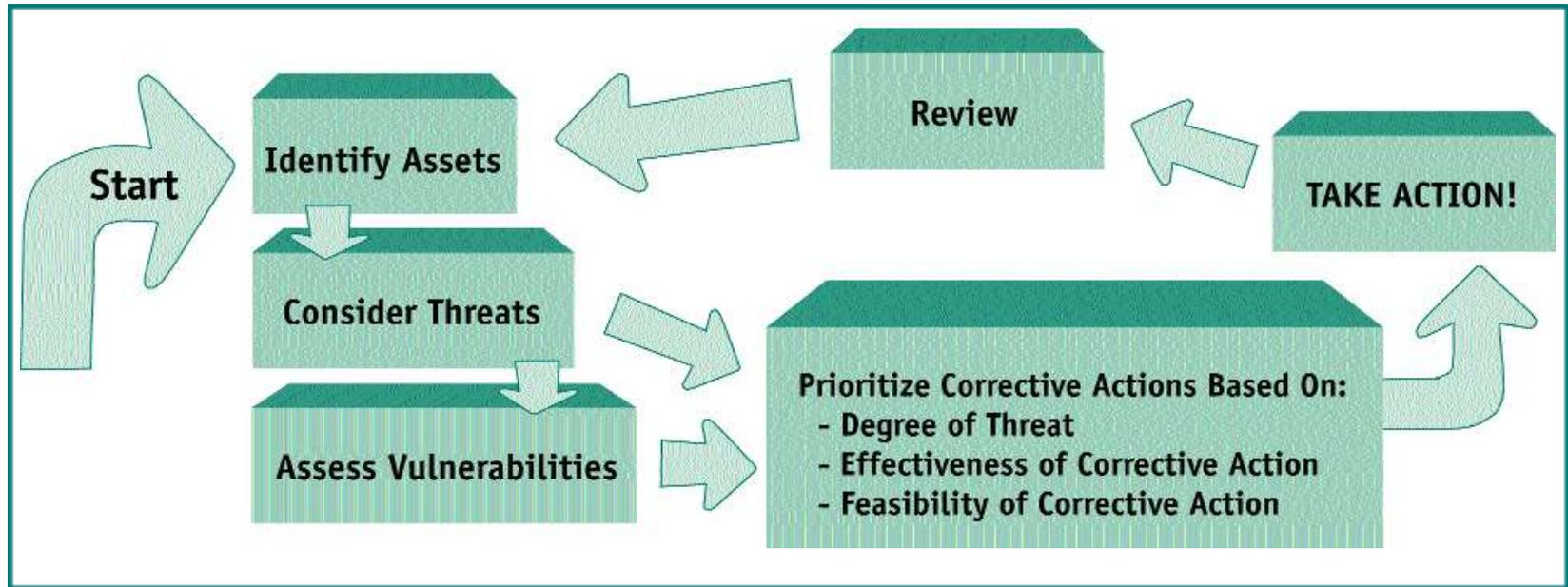
# ■ Vulnerability/ Risk

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# Vulnerability Analysis



# WWTP Vulnerabilities



- 1. Collection systems' network of sewers
- 2. Treatment chemicals
- 3. Key components of a wastewater treatment plant
- 4. Control systems
- 5. Pumping stations
- 6. Lack of security culture
- 7. Interdependencies among all major wastewater assets
- 8. Interdependencies between wastewater systems and other critical infrastructures

# Form the Team



- The size of the planning team will depend on the facility's operations, requirements and resources. Usually involving a group of people is best because:
- It encourages participation and gets more people invested in the process.
- It increases the amount of time and energy participants are able to give.
- It enhances the visibility and stature of the planning process.
- It provides for a broad perspective on the issues.
- Determine who can be an active member and who can serve in an advisory capacity. In most cases, one or two people will be doing the bulk of the work. At the very least, you should obtain input from all functional areas. Remember:
- Upper management
- Line management
- Labor
- Human Resources
- Engineering and maintenance
- Safety, health and environmental affairs
- Public information officer
- Security
- Community relations
- Sales and marketing
- Legal
- Finance and purchasing
- Have participants appointed in writing by upper management. Their job descriptions could also reflect this assignment

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# Establish Authority



- Demonstrate management's commitment and promote an atmosphere of cooperation by "authorizing" the planning group to take the steps necessary to develop a plan.
  - The group should be led by the chief executive or the plant manager. Establish a clear line of authority between group members and the group leader, though not so rigid as to prevent the free flow of ideas.
-

# Issue a Mission Statement



Have the chief executive or plant manager issue a mission statement to demonstrate the company's commitment to emergency management.

The statement should:

- Define the purpose of the plan and indicate that it will involve the entire organization
- Define the authority and structure of the planning group

# Establish a Schedule and Budget



- Establish a work schedule and planning deadlines. Timelines can be modified as priorities become more clearly defined.
- Develop an initial budget for such things as research, printing, seminars, consulting services and other expenses that may be necessary during the development process.

# Wastewater Security Improvements

- **What specific activities do wastewater experts suggest to improve wastewater security?**
- The three most important activities to improve wastewater security are:
  - 1. Replacing gaseous chemicals used in wastewater treatment with less hazardous alternatives.
  - 2. Improving local, state, and regional collaboration efforts.
  - 3. Completing vulnerability assessments for individual wastewater systems.



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# Elements of Emergency Response Plan

## Where do you stand right now?

- Evacuation plan
- Fire protection plan
- Safety and health program
- Environmental policies
- Security procedures
- Insurance programs
- Finance and purchasing procedures
- Plant closing policy
- Employee manuals
- Hazardous materials plan
- Process safety assessment
- Risk management plan
- Capital improvement program
- Mutual aid agreements



# Meet with outside groups

- Community emergency management office
- Mayor or Community Administrator's office
- Local Emergency Planning Committee (LEPC)
- Fire Department
- Police Department
- Emergency Medical Services organizations
- American Red Cross
- National Weather Service
- Public Works Department
- Planning Commission
- Telephone companies
- Electric utilities
- Neighboring businesses



# Identify Codes & Regulations



KNOW  
the  
RULES

- Occupational safety and health regulations
  - Environmental regulations
  - Fire codes
  - Seismic safety codes
  - Transportation regulations
  - Zoning regulations
  - Corporate policies
-

---

# Identify Critical Products, Services and Operations

- Company products and services and the facilities and equipment needed to produce them
  - Products and services provided by suppliers, especially sole source vendors
  - Lifeline services such as electrical power, water, sewer, gas, telecommunications and transportation
  - Operations, equipment and personnel vital to the continued functioning of the facility
-

---

# Identify Internal Resources & Capabilities

- Personnel -- fire brigade, hazardous materials response team, emergency medical services, security, emergency management group, evacuation team, public information officer
  - Equipment -- fire protection and suppression equipment, communications equipment, first aid supplies, emergency supplies, warning systems, emergency power equipment, decontamination equipment
  - Facilities -- emergency operating center, media briefing area, shelter areas, first-aid stations, sanitation facilities
  - Organizational capabilities -- training, evacuation plan, employee support system
  - Backup systems -- arrangements with other facilities to provide for:
    - Payroll
    - Communications
    - Production
    - Customer services
    - Shipping and receiving
    - Information systems support
    - Emergency power
    - Recovery support
  - One way to increase response capabilities is to identify employee skills (medical, engineering, communications, foreign language) that might be needed in an emergency
-

# Identify External Resources

- There are many external resources that could be needed in an emergency. In some cases, formal agreements may be necessary to define the facility's relationship with the following:
  - ❑ Local emergency management office
  - ❑ Fire Department
  - ❑ Hazardous materials response organization
  - ❑ Emergency medical services
  - ❑ Hospitals
  - ❑ Local and State police
  - ❑ Community service organizations
  - ❑ Utilities
  - ❑ Contractors
  - ❑ Suppliers of emergency equipment
  - ❑ Insurance carriers



# Do a Insurance Review

- Meet with insurance carriers to review all policies



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# Conduct a Vulnerability Analysis

- The next step is to assess the vulnerability of your facility -- the probability and potential impact of each emergency. Use the Vulnerability Analysis Chart to guide the process, which entails assigning probabilities, estimating impact and assessing resources, using a numerical system. The lower the score the better.
- **Vulnerability Analysis Chart**
  - Rate each criteria on a scale of 1 to 5 with 1 being low and 5 being high.
  - **Type of Emergency Probability Human Impact, Property Impact, Business Impact, Internal Resources, External Resources, Total**



# Vulnerability Analysis Chart

Type of Emergency	Probability	Human Impact	Property Impact	Business Impact	Internal Resource	External Resources	Total
Transformer Fails	1	2	5	5	4	2	19

# List Potential Emergencies



In the first column of the chart, list all emergencies that could affect your facility, including those identified by your local emergency management office. Consider both:

- ❑ Emergencies that could occur within your facility
- ❑ Emergencies that could occur in your community
- ❑ Below are some other factors to consider

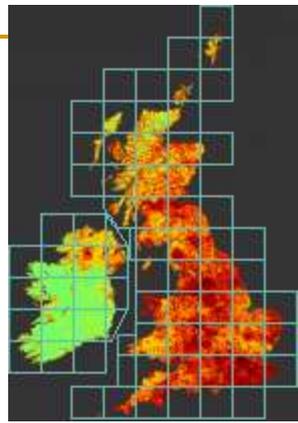
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# Historical

- **Historical** -- What types of emergencies have occurred in the community, at this facility and at other facilities in the area?
  - Fires
  - Severe weather
  - Hazardous material spills
  - Transportation accidents
  - Earthquakes
  - Hurricanes
  - Tornadoes
  - Terrorism
  - Utility outages



# Geographic



- **Geographic -- What can happen as a result of the facility's location? Keep in mind:**
    - Proximity to flood plains, seismic faults and dams
    - Proximity to companies that produce, store, use or transport hazardous materials
    - Proximity to major transportation routes and airports
    - Proximity to nuclear power plants
-

# Technological

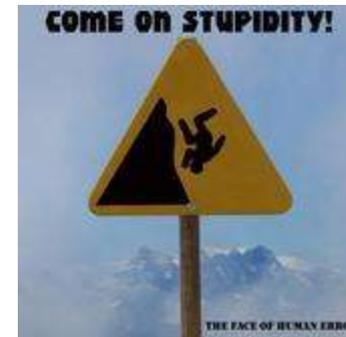


- **Technological -- What could result from a process or system failure? Possibilities include:**
  - ❑ Fire, explosion, hazardous materials incident
  - ❑ Safety system failure
  - ❑ Telecommunications failure
  - ❑ Computer system failure
  - ❑ Power failure
  - ❑ Heating/cooling system failure
  - ❑ Emergency notification system failure

---

# Human Error

- **Human Error** -- What emergencies can be caused by employee error? Are employees trained to work safely? Do they know what to do in an emergency? Human error is the single largest cause of workplace emergencies and can result from:
  - ❑ Poor training
  - ❑ Poor maintenance
  - ❑ Carelessness
  - ❑ Misconduct
  - ❑ Substance abuse
  - ❑ Fatigue



# Plant Layout

- **Physical** -- What types of emergencies could result from the design or construction of the facility? Does the physical facility enhance safety? Consider:
  - ❑ The physical construction of the facility
  - ❑ Hazardous processes or byproducts
  - ❑ Facilities for storing combustibles
  - ❑ Layout of equipment
  - ❑ Lighting
  - ❑ Evacuation routes and exits
  - ❑ Proximity of shelter areas



# Regulatory

**Regulatory** -- What emergencies or hazards are you regulated to deal with?

- Analyze each potential emergency from beginning to end. Consider what could happen as a result of:
  - ❑ Prohibited access to the facility
  - ❑ Loss of electric power
  - ❑ Communication lines down
  - ❑ Ruptured gas mains
  - ❑ Water damage
  - ❑ Smoke damage
  - ❑ Structural damage
  - ❑ Air or water contamination
  - ❑ Explosion
  - ❑ Building collapse
  - ❑ Trapped persons
  - ❑ Chemical release



# Estimate Probability



- In the Probability column, rate the likelihood of each emergency's occurrence. This is a subjective consideration, but useful nonetheless. Use a simple scale of 1 to 5 with 1 as the lowest probability and 5 as the highest.

# Probability



- **Estimate Probability**
- In the Probability column, rate the likelihood of each emergency's occurrence. This is a subjective consideration, but useful nonetheless.
- Use a simple scale of 1 to 5 with 1 as the lowest probability and 5 as the highest.

---

# Assess the Potential Business Impact

- Consider the potential loss of market share. Assign a rating in the Business Impact column. Again, 1 is the lowest impact and 5 is the highest. Assess the impact of:
    - ❑ Business interruption
    - ❑ Employees unable to report to work
    - ❑ Customers unable to reach facility
    - ❑ Company in violation of contractual agreements
    - ❑ Imposition of fines and penalties or legal costs
    - ❑ Interruption of critical supplies
    - ❑ Interruption of product distribution
-

---

# Implement the Plan

- Emergency planning must become part of the corporate culture.
  - Look for opportunities to build awareness; to educate and train personnel; to test procedures; to involve all levels of management, all departments and the community in the planning process; and to make emergency management part of what personnel do on a day-to-day basis.
  - Test How Completely The Plan Has Been Integrated By Asking:
    - How well does senior management support the responsibilities outlined in the plan?
    - Have emergency planning concepts been fully incorporated into the facility's accounting, personnel and financial procedures?
-

---

# Implement the Plan

- How can the facility's processes for evaluating employees and defining job classifications better address emergency management responsibilities?
  - Are there opportunities for distributing emergency preparedness information through corporate newsletters, employee manuals or employee mailings?
  - What kinds of safety posters or other visible reminders would be helpful?
  - Do personnel know what they should do in an emergency?
  - How can all levels of the organization be involved in evaluating and updating the plan?
-

---

# Conduct Training, Drills and Exercises

- Everyone who works at or visits the facility requires some form of training. This could include periodic employee discussion sessions to review procedures, technical training in equipment use for emergency responders, evacuation drills and full-scale exercises. Below are basic considerations for developing a training plan.
  
  - Planning Considerations Assign responsibility for developing a training plan. Consider the training and information needs for employees, contractors, visitors, managers and those with an emergency response role identified in the plan. Determine for a 12 month period:
    - Who will be trained?
    - Who will do the training?
    - What training activities will be used?
    - When and where each session will take place?
    - How the session will be evaluated and documented?
  
  - Conduct reviews after each training activity. Involve both personnel and community responders in the evaluation process.
-

---

# Conduct Training, Drills and Exercises

- Training Activities Training can take many forms:
  - Orientation and Education Sessions - These are regularly scheduled discussion sessions to provide information, answer questions and identify needs and concerns.
  - Tabletop Exercise - Members of the emergency management group meet in a conference room setting to discuss their responsibilities and how they would react to emergency scenarios. This is a cost-effective and efficient way to identify areas of overlap and confusion before conducting more demanding training activities.
  - Walk-through Drill - The emergency management group and response teams actually perform their emergency response functions. This activity generally involves more people and is more thorough than a tabletop exercise.
-

---

# Conduct Training, Drills and Exercises

- **Functional Drills** - These drills test specific functions such as medical response, emergency notifications, warning and communications procedures and equipment, though not necessarily at the same time. Personnel are asked to evaluate the systems and identify problem areas.
  - **Evacuation Drill** - Personnel walk the evacuation route to a designated area where procedures for accounting for all personnel are tested. Participants are asked to make notes as they go along of what might become a hazard during an emergency, e.g., stairways cluttered with debris, smoke in the hallways. Plans are modified accordingly.
  - **Full-scale Exercise** - A real-life emergency situation is simulated as closely as possible. This exercise involves company emergency response personnel, employees, management and community response organizations.
-

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# Conduct Training, Drills and Exercises

- Employee Training General training for all employees should address:
  - Individual roles and responsibilities
  - Information about threats, hazards and protective actions
  - Notification, warning and communications procedures
  - Means for locating family members in an emergency
  - Emergency response procedures
  - Evacuation, shelter and accountability procedures
  - Location and use of common emergency equipment
  - Emergency shutdown procedures
  - The scenarios developed during the vulnerability analysis can serve as the basis for training events.
  - OSHA training requirements are a minimum standard for many facilities that have a fire brigade, hazardous materials team, rescue team or emergency medical response team.
-

# Conduct Training, Drills and Exercises

- Evaluate and Modify the Plan Conduct a formal audit of the entire plan at least once a year. Among the issues to consider are:
    - How can you involve all levels of management in evaluating and updating the plan?
    - Are the problem areas and resource shortfalls identified in the vulnerability analysis being sufficiently addressed?
    - Does the plan reflect lessons learned from drills and actual events?
    - Do members of the emergency management group and emergency response team understand their respective responsibilities? Have new members been trained?
    - Does the plan reflect changes in the physical layout of the facility? Does it reflect new facility processes?
    - Are photographs and other records of facility assets up to date?
    - Is the facility attaining its training objectives?
    - Have the hazards in the facility changed?
    - Are the names, titles and telephone numbers in the plan current?
    - Are steps being taken to incorporate emergency management into other facility processes?
    - Have community agencies and organizations been briefed on the plan? Are they involved in evaluating the plan?
  - In addition to a yearly audit, evaluate and modify the plan at these times:
    - After each training drill or exercise
    - After each emergency
    - When personnel or their responsibilities change
    - When the layout or design of the facility changes
    - When policies or procedures change
    - Remember to brief personnel on changes to the plan.
  - Conduct a formal audit of the entire plan at least once a year.
-

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# Assess the Potential Property Impact

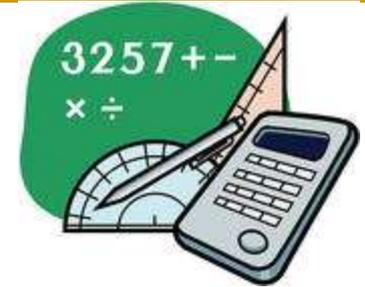
- Consider the potential property for losses and damages. Again, assign a rating in the Property Impact column, 1 being the lowest impact and 5 being the highest. Consider:
    - Cost to replace
    - Cost to set up temporary replacement
    - Cost to repair
    - A bank's vulnerability analysis concluded that a "small" fire could be as catastrophic to the business as a computer system failure. The planning group discovered that bank employees did not know how to use fire extinguishers, and that the bank lacked any kind of evacuation or emergency response system.
-

# Assess Internal and External Resources



- Next assess your resources and ability to respond. Assign a score to your Internal Resources and External Resources. The lower the score the better. To help you do this, consider each potential emergency from beginning to end and each resource that would be needed to respond. For each emergency ask these questions:
  - ❑ Do we have the needed resources and capabilities to respond?
  - ❑ Will external resources be able to respond to us for this emergency as quickly as we may need them, or will they have other priority areas to serve?
  - ❑ If the answers are yes, move on to the next assessment. If the answers are no, identify what can be done to correct the problem. For example, you may need to:
    - ❑ Develop additional emergency procedures
    - ❑ Conduct additional training
    - ❑ Acquire additional equipment
    - ❑ Establish mutual aid agreements
    - ❑ Establish agreements with specialized contractors

# Add the Columns



- Total the scores for each emergency. The lower the score the better. While this is a subjective rating, the comparisons will help determine planning and resource priorities.
- When assessing resources, remember that community emergency workers -- police, paramedics, firefighters -- will focus their response where the need is greatest. Or they may be victims themselves and be unable to respond immediately. That means response to your facility may be delayed.

# Vulnerability Analysis Chart

Type of Emergency	Probability	Human Impact	Property Impact	Business Impact	Internal Resource	External Resources	Total
Raw Pump VFD Fails	2	2	3	4	2	2	15



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# Asset Physical Plant – The Checklist



- **ENTRY/ACCESSCONTROL**
- Limiting access to employees or people having valid business at the facility
- Controlling access by a posted guard or through electronic means
- Locking of doors and windows
- Strength of doors, windows and locks
- Entry codes and locksets
- Control of visitors, photo identification, sign in and out, and facility escorts
- Facility tours
- Security of fill and vent pipes of chemical and fuel storage tanks

# Asset Physical Plant



- **SURVEILLANCE**
- Alarming of buildings and critical structures to detect intrusion
- Alarming of emergency exit doors
- Monitoring interior of buildings by closed circuit television (CCTV)
- Site monitoring by CCTV
- Continuous monitoring of alarms and CCTV with a reporting protocol
- Connecting alarms and monitoring systems to an uninterruptible power supply
- Night lighting throughout the facility for surveillance
- Emergency lighting for evacuation of premises
- Public address or other warning system to notify people within a facility of an incident
- Overgrowth of trees and shrubs that may block views of doors and windows

# Asset Physical Plant



- Parking of private vehicles near buildings and other structures
- Locking and storage of utility's vehicles
- Policies for the use and operation of utility's vehicles
- Monitoring of utility's vehicles via a real-time tracking system
- Inspection of delivery vehicles
- Designation of distinct delivery areas for receiving and screening packages prior to
- their distribution within a facility

# Asset Physical Plant



- **COLLECTION SYSTEM**
- Access to sewers in the vicinity of government buildings, financial districts,
- hospitals and other critical commercial /industrial areas (e.g. chemical manufacturing,
- defense plants, etc)
- Secured combined sewer outfalls to prevent entry
- Security of tributary collection systems operated by other entities
- Training of pretreatment inspectors and other employees to identify vulnerable points
- in the sewerage system

# Asset Physical Plant



- **HAZARDOUS MATERIAL CONTROL**
- Identification of hazards from process chemicals and other acutely hazardous materials
- Identification of acutely hazardous materials (AHMs) from adjacent establishments
- and facilities
- Tracking mechanism to account for all process chemicals and other acutely hazardous
- materials received and used at utility facilities
- Gas detection equipment
- Information available to employees or others responding to hazardous chemicals or toxins
- that may be introduced into the sewer system or treatment plant

# Asset Physical Plant



- **P E R I M E T E R**
- Perimeter physical barriers, such as a fence or wall
- Locking of perimeter gates
- Patrolling perimeter by guards or electronic monitoring

# Asset People



- HUMAN RESOURCE POLICY
- Policies on background checks for potential employees before hiring
- Policies on periodic criminal checks for existing employees
- Procedures for employees who may be called to active duty in the military
- Legal rights afforded to employees who are reservists and members of the National Guard that are called for active military duty
- Policy to address compensation and benefits for employees who are called to active duty
- Policy to address compensation and benefits for employees who remain on-the-job for elongated periods during an incident
- Plan for management to effectively react when some employees may refuse to come to work during an incident
- Plan to transport personnel to and from their place of work if roads and streets are closed due to police order or physically blocked as a result of an incident
- Plan to mitigate the concern employees may have for their families' well being during a disaster
- Management discussion of security issues, emergency response plan, and disaster plan with union representatives

# Asset People



- **PLANNING AND TRAINING**
- Employee training to properly handle a threat that is received in-person, by phone,
- by e-mail, by U.S. mail or by other delivery service
- Employees know the procedures to follow should an incident occur
- Management knows whom to contact to report a threat or emergency
- Procedures for determining when and how to evacuate a building
- Employee training in security measures
- Employee training in emergency preparedness in accordance with the utility's adopted plan
- Employees training to detect symptoms of a chemical or biological attack
- First aid training for employees

# Asset Knowledge Base



- **P L A N N I N G**
- Emergency response and disaster recovery plans updated and distributed
- Plan testing for workability
- Management contact with law enforcement agencies, fire departments, HazMat teams, and the local office of the FBI. Coordination of emergency response and disaster recovery plans
- with these agencies

# Asset Knowledge Base



- **CRITICAL BUSINESS DOCUMENTS**
- “As-built” drawings up-to-date and easily accessible for use during an incident
- A comprehensive contact list for employees that includes names and phone numbers of
- local law enforcement and fire protection agencies, paramedics, emergency response teams,
- the local FBI office, and the Center for Disease Control
- Protection from public disclosure of documents and electronic information that reveal
- vulnerabilities
- Designated secure location for management to meet and strategize a response to incidents
- Availability of paper and electronic copies of emergency response information
- Procurement records

# Asset Information Technology



- **P O L I C I E S   A N D   P L A N N I N G**
- Policies to govern and monitor Internet access and use
- Asset Classification and Control Procedures
- Access Controls and Procedures relating to both Internal and External Users
- Emergency response plans' guidance on communications options during a total loss of telephone
- communications, loss of radio communications, or loss of Internet communications

# Asset Information Technology



- P R O T E C T I O N
- Screening of network traffic for viruses and attacks; virus protection for computers
- The utility's network has a security architecture implemented for external communications
- Access via modem to the utility's wide area network (WAN)
- Vulnerability/penetration evaluations or tests on utility networks
- Modems attached to end-user desktop systems on the secure local area network (LAN)
- Local / back-up power supply in the event of loss of electric utility supply

# Asset Information Technology



- S C A D A
- Single points of failure in the supervisory control and data acquisition (SCADA) system
- Periodic identification and back up of “operational-critical” applications, databases,
- and to an off-site facility
- Vulnerability/penetration tests on SCADA systems
- The SCADA system connection to the LAN/WAN
- Secure locations for the SCADA system components (RTUs, central monitoring)

# Asset Customers



- **COMMUNICATIONS**
- Utility customers have information about the planning the utility has done, and procedures it has in place, to mitigate the effect of service interruptions
- Customers have information to cope with service interruptions
- Discussions of emergency planning efforts and possible consequences that may result with
  - the appropriate regulatory agencies
  - Boilerplate draft press releases and public notices for use during an incident
  - A trained spokesperson as point-of-contact for the media
  - Management meetings with representatives of the jurisdiction's HazMat team, fire/rescue department and law enforcement agency to assure that the utility will be made aware of any hazardous materials that might enter the sewer system during an incident
  - Advising industrial, educational and government customers to examine their internal collection systems for vulnerabilities and share the information with the utility
- Customers are aware of what activities they should report (and who to call) if they witness something unusual with a utility vehicle, employee, or system asset

# Asset Customers



- Access to funds and investment records
- Coordination with billing agency (in many cases, such as the local water supplier, tax collector, or other local entity) to assure continued collection of wastewater charges and fees during an incident and recovery
- Maintenance of sufficient reserves to fund operations over a pre-planned period when cash flow may be hampered due to interruption in mail or electronic funds transfer service, delay in revenue submittal from the water supplier, or other adverse event
- A contingency line item or reserves are available to pay for overtime, tanker trucks and other incident-response actions to maintain basic customer services

# Asset People



- Employees' photo-identification badges
- Employee communications equipment to rapidly report incidents
- Employee monitors for radiation, chemical or biological detection
- Periodic changes in employee keys and pass-codes
- Biometric devices to control access to sensitive areas
- Contractors, vendors and visitors
- Personal protection devices and first-aid materials at worksites
- Provisions for food, water and rest for employees that remain on the job for extended periods of time
- Up-to-date list of all employees, their phone numbers and emergency contact information
- An employee assistance program to counsel employees and their families on life-crisis management
- Weapons at utility facilities

# Disaster Preparedness Exercise



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# TTX Mantra's

- You play like you practice
- Protect people and revenue



---

# Audience Actors Needed

- Drinking Water
  - Wastewater
  - Police
  - Fire
  - Hospital/Epidemiologist
  - Acme Industries Inc.
-





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# Rationality

- The state of being rational or logical
  - The possession of reason or logic
-

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# ■ Water Sector Survival

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# Volunteers

- Drinking Water
  - Wastewater
  - Hospital/epidemiological
  - Police
  - Fire
  - Acme Industries Inc.
-

---

# Zenith City

- Zenith City is a city of 100,000 population
  - Zenith City operates a groundwater well drinking water system with hardness treatment, chlorine, ammonia, fluoride, and phosphate and rapid sand filters
  - Zenith City operates a biological advanced secondary wastewater treatment plant
-

---

# Ground Rules

- Audience...you should participate...learn how to fish
  - No wrong answers
-

# ZENITH CITY WATER SYSTEM

Zenith City Water System			
Zenith City Water Treatment Plant (Surface water)		25 MGD	
Groundwater pumping stations			
A	700 gpm	0.8 MGD	backup
B	1200 gpm	1.0 MGD	year-round
C	1200 gpm	1.0 MGD	year-round
D	700 gpm	0.8 MGD	backup
Subtotal:		4.8 MGD	
Total Capacity:		29.8 MGD	
Water Tanks			
Tree Hill	1 MGD	Standpipe	Tank diameter 58 feet, Depth 55 feet
Strawberry Hill	1 MGD	Standpipe	58 feet, 55 feet
Rowwood	0.5 MGD	Elevated Tank	55 feet, 25 feet
Tall Oak	0.5 MGD	Elevated Tank	55 feet, 25 feet

- LEGEND**
- 16" WATERMAIN
  - 12" WATERMAIN
  - 8" WATERMAIN
  - 6" WATERMAIN
  - 4" & UNDER WATERMAIN
  - HYDRANT
  - WATER GATE VALVE
  - GROUNDWATER SUPPLY PUMPING STATION
  - WATER SUPPLY STORAGE TANK
  - FIRE STATION
  - HOSPITAL
  - CHURCH
  - PUBLIC STATION
  - STADIUM
  - SCHOOL
  - MAJOR INDUSTRIAL BUILDING
  - WTP WASTEWATER TREATMENT PLANT
  - WTP WATER TREATMENT PLANT
  - RAIL LINE
  - BRIDGE
  - DAM
  - MARSH



NOT TO SCALE

TO ALTA CITY

---

# Zenith City WWTP

- June 7, 2011 @ 8:30 am
- Zenith City Wastewater Treatment Plant (WWTP) detects die off of bacteria in the aeration tanks
- WWTP samples influent for toxicants
  - Results pending
- WWTP broadens sampling strategy

---

# WWTP industries sampled

- 9:00 am
  - WWTP evaluates possible upstream sources
    - Acme Industries Co. effluent sampled – Results pending
    - Pete's Pesticides Inc. effluent sampled – Results pending
    - PCB Circuit Boards Inc. effluent sampled – Results pending
-

---

# People presenting at Hospital

- 9:00 am
  - People presenting at Zenith City General Hospital Emergency Room
  - Spike in ER visits to Zenith City General Hospital: 18 people so far
-

# Hospital ER

- ❑ 9:00 am
- ❑ Most have similar signs & symptoms
  - Headaches
  - Nausea & vomiting
  - Bitter, acrid, burning taste
  - Weakness / dizziness
  - Shortness of breath
  - Loss of consciousness
- ❑ Blood work and urinalysis expected in ~24 hours
- ❑ Doctors treating based on clinical acumen



---

# Hospital Epidemiologist

- Hospital epidemiologist investigates emergency room patients



---

# Hospital ER

- 10:00 am
  - Epidemiological investigation initially focuses on food
    - Food eventually ruled out
  - All patients either live or work in or near Brooks Industrial Park
    - Blood work and urinalysis results still pending
  - Epi investigation continues
-

# Epi points to drinking water

- 10:45 am
- Hospital epi hypothesis now begins to focus on exposure via drinking water
  - Common factor: drinking water followed immediately by acute symptoms
  - Awaiting results of lab tests of clinical patient samples



# County Health Department

- 11:00 am
- County HD notified of Epi hypothesis
  - Very concerned by implications of hypothesis
- County HD contacts drinking water authority



---

# Utility Director

- 11:00 am
  - Wastewater superintendent informs Zenith City Utility Director of the high zinc and cyanide concentrations
  - Utility director copies all department heads of the high zinc and cyanide concentrations.
-

---

# Water Sup't / Utility Director

- 11:10 am
  - Water Superintendent confers with Utility Director about the hospital epi investigation indicating possible drinking water toxics.
  - Water Superintendent informed of high zinc and cyanide concentrations in the sewers in Brooks Industrial Park.
-

---

# Sewer Samples

- 6/7/11 at 11 am
- Brooks Industrial Park interceptor identified as having high zinc and cyanide concentrations



---

# Drinking Water Samples

- Zenith City Water samples Brooks Industrial Park water main for toxics at 11:30am
  - Results pending
-

# Epi Water Nexus ? ?

- 12 noon
- Epi investigation establishes drinking water as the source of the outbreak
  - Potassium cyanide [KCN] confirmed in clinical samples
  - Hi zinc concentration also identified
- County HD in contact with water utility
- Water utility lab does additional testing
  - Finished water w/in allowable parameters !
  - Raw water also w/in allowable parameters !
- No natural explanation for events ? ?

# Technical Info

- Potassium Cyanide (KCN) is widely used in electroplating baths in addition to cyanides of the metal to be deposited in order to:
  - ❑ Facilitate anode corrosion
  - ❑ Help maintain constant metal ion level
  - ❑ Contribute to conductivity
- Other KCN uses:
  - ❑ Circuit board manufacturing
  - ❑ Metal extraction from ores
  - ❑ *Livestock protection collars* and other forms of predator control

# Technical Info

KCN is generally shipped in 100 kg quantities in blue polyethylene drums or steel, plastic-lined ISO containers



# Technical Info

- 100 kg (220 lbs.) of KCN will contaminate 600,000 gallons of water to  $LD_{low}$ 
  - = 44 mg/l (ppm)
- Average person drinks  $\frac{1}{2}$  gallon water/day
  - Average person uses ~2 gallons of water/day for drinking and cooking
  - Average person uses ~100 gallons of water/day for all purposes

---

# Brooks Industrial Park (BIP)

- 2:00 pm
- General location of the zinc cyanide contamination plotted from human Epi data, water system samples and wastewater system samples to be the Brooks Industrial Park
- Both water and wastewater personnel are now jointly inspecting all industries in Brooks Industrial Park

---

# Acme Industries

- 3:00pm
- Inspection of Acme Plating Inc. in BIP shows a backflow preventer has been modified by disgruntled employee.
- A pump is found pumping zinc cyanide plating solution into a 3/4" water line at the zinc cyanide electroplating tank.
- Zenith City police are called and apprehend the employee. Criminal investigation pursued.

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# Technical Info

- KCN quickly metabolizes out of the body and may be impossible to detect >24 hours
  - True extent of contamination / intoxication may be impossible to determine
- Studies indicate that only ~25% of people who feel sick actually go to a hospital
  - 75% of people who feel sick don't!
- The total number of actual victims may never be known!



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# Ten Steps to Maintain Critical Wastewater Services and Protect Public Health in an Emergency

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Comprehensive Emergency Management



# Step 1



- Make an emergency contact list that includes all essential contacts.
  - Post by each telephone and distribute to all staff
  - Review and update the list quarterly, and as changes occur
  - Include contacts needed to inform your community of emergencies

# Step 2



- **Inspect your facilities daily.**
  - Inspect treatment facilities (e.g., lift/pump stations, outfalls, chemical storage areas, fences, etc.)
  - Use a security checklist to log results
  - Take immediate action to address vulnerabilities

# Step 3



- **Make security and preparedness everyone's job.**
  - ❑ Leaders must set a good example toward security
  - ❑ Make all staff accountable for their security actions
  - ❑ Report problems immediately
  - ❑ Implement a plan to communicate regularly with employees, emergency responders, and customers about security issues
  - ❑ Have plans to increase security when risks are elevated

# Step 4



- **Limit and control access to facilities.**
  - Routinely lock all doors and gates
  - Remove keys and lock vehicles
  - Limit key access to essential personnel
  - Keep track of who has keys

# Step 5



- Establish relationships with emergency personnel and neighboring facilities.
    - Involve emergency personnel in your emergency planning (e.g., fire, police, hospitals, etc.)
    - Establish mutual aid agreements with neighboring facilities, as appropriate
    - Familiarize emergency personnel with all aspects and vulnerabilities of your system
-

# Step 6



- **Practice safe chemical handling and usage.**
  - ❑ Control chemical deliveries and be aware of delivery dates
  - ❑ Store chemicals safely and securely
  - ❑ Dispose of chemicals properly

# Step 7



- **Secure your records and maps.**
  - ❑ Update and organize critical information
  - ❑ Control access to records and maps
  - ❑ Backup computer files regularly
  - ❑ Install updated virus protection and firewall on computers
  - ❑ Secure deeds, titles, reports, etc. with copies or protection from fire and water damage

# Step 8



- **Assess threats and identify vulnerabilities.**
  - ❑ Prioritize key threats and vulnerabilities
  - ❑ Harden facilities that are vulnerable to security threats and natural disasters
  - ❑ Take appropriate steps to prevent, detect, delay, and deter intruders
  - ❑ Consider security and emergency preparedness when making system changes
  - ❑ Review security priorities annually

# Step 9



- Have an emergency response plan for your wastewater system.
  - ❑ Know key steps to take in an emergency
  - ❑ Identify sources of backup equipment and assistance
  - ❑ Train staff on the plan, and test it with emergency personnel and neighboring facilities
  - ❑ Practice, practice, practice
  - ❑ Update the plan annually

# Step 10



- Educate staff, elected officials, and community members about how they can protect their wastewater system.
  - ❑ Do not place hazardous material or objects in collection systems
  - ❑ Report suspicious behavior and vandalism immediately
  - ❑ Recognize and report abnormal situations
  - ❑ Use neighborhood watch programs to help protect collection systems and other wastewater assets



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# Emergency Planning & Preparedness Tips for WWTP and WTP Operators

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Comprehensive Emergency Management



# Tips



- *Staff Training* - Insure that all staff is familiar with emergency protocols, including assignments and responsibilities. Conduct periodic training exercises. Make sure key staff are trained and have a working knowledge of the National Incident Management System (NIMS) and the Incident Command System (ICS) in case you are involved with an emergency situation that triggers the use of these management and coordination systems.

# Tips

- *Continuity of Operations Plan (COOP)* - Make sure that your COOP is up-to-date and anticipates how you would continue to keep your facility staffed and operational during a variety of emergency situations.
- Develop a list of key people/agencies to contact including how they can be contacted in an emergency. Maintain accurate employee lists and emergency contact lists including EPA and DEQ regional staff.
- Develop protocols in case telephone lines are down and cell phones do not work. Consider use of CB radios or satellite phones with a supply of extra batteries.



# Tips



- *Emergency Power* - Standby power equipment capable of running all equipment, including major pump stations, and consistent with applicable discharge permit requirements shall be provided.
- This includes both fixed-in-place generators and portable generators. All standby power facilities should be tested monthly, including transfer switches.
- An adequate fuel supply (10-14 days) should be provided. If necessary, fill all fuel tanks prior to the event

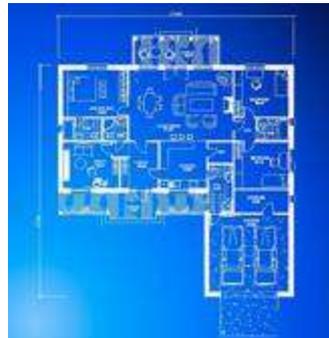
# Tips



- *Hazardous Materials* - Conduct an inventory of potentially hazardous chemicals/materials, including those that by themselves may be safe but could potentially be hazardous in combination with other chemicals.
- Particular attention should be paid to chlorine storage areas and chlorine equipment. Develop safety protocols, including staff training, in case of hazardous release.
- Develop a list of emergency contacts, including the local fire department, dependent on the problem.

# Tips

- *Record Drawings and O&M Manual* - Insure that updated copies of record drawings and an O&M Manual are available, both for the treatment facilities and the pump stations.



# Tips

- *Identify Flood-Prone Areas* - Develop a list of areas potentially subject to flooding, such as manholes, open tanks, pump wells, wells, etc. Any special equipment required when those areas are flooded should be purchased. Also consider having an inventory of sand bags available for limited "flood-proofing" during minor flooding situations.



# Tips



- *Spare Parts* - Insure that an adequate spare parts inventory is available.
  - *Chemical Inventories* - Insure that adequate chemical inventories are available (10-14 days).
  - *Vehicles* - Check that all vehicles are in proper working order and fuel tanks are filled.
  - *Supplies* - Insure that adequate supplies are available for on-duty personnel during the emergency conditions, including non-perishable food, potable water, flashlights, first aid supplies, and cots.
  - *Protection of Facilities* - As appropriate, have plans for protecting and securing windows and exposed equipment. Consider having an inventory of lumber available for use in protecting windows.
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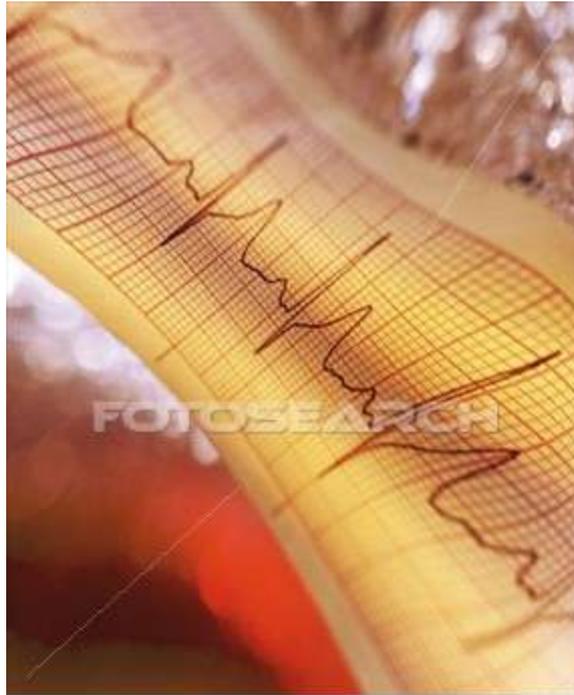
# Tips

- ***Facility Access*** - To insure access to the facility after a storm, there should be equipment for clearing debris, including chain saws with an adequate fuel supply and axes. If possible, identify an area to stage storm debris until it can be removed from the site. Make sure fuel for emergency equipment is stored safely, in a manner that will not contaminate the drinking water supply.
- ***Interconnections*** - Locate and exercise all interconnections that may be needed during an emergency.



# Tips

- Wastewater treatment plants are often the first to see problems in the water system.



# Prepared for all hazards

- Natural Incidents
- C HEMICAL
- B IOLOGICAL
- R ADIOLOGICAL
- N UCLEAR
- E XPLOSIVE
- CYBER





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# Post Incident

- The post-incident review process clearly provides an opportunity to learn from disasters and crises.
- Applying lessons learned to your disaster and crisis management program allows you to bring your procedures into focus with reality, and more importantly, it enables you to use the incident as a means of improving your program to better prepare for future situations.



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# Post Incident

- **The termination process is divided into three phases:**
  - **Debriefing**
  - **Post-Incident Analysis**
  - **The Critique**



# Post Incident



- **An effective debriefing should:**
  - ❑ **Identify damaged equipment in need of service, replacement, or repair.**
  - ❑ **Identify equipment or expanded supplies that will require specialized decontamination or disposal.**

# Post Incident Analysis



Six Key Topics:

- **Command and Control**
- **Key Tactical Operations**
- **Resources**
- **Support Services**
- **Plans and Procedures**
- **Training**

# Post Incident Analysis



- **What worked ?**
- **What Didn't ?**
- **Were mutual aid agreements implemented effectively?**
- **Are improvements needed to equipment or facilities?**
- **Were human and material resources adequate to conduct the response effectively?**
- **ERP Adequate?**
- **Training Adequate?**

# Post Incident Critique



- **It is important that plans and procedures that work and don't work are identified through the critique process.**
- **This information is then used to change and improve the emergency response system**

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# Post Incident Critique



- When problems are uncovered avoid placing blame; everyone must make a commitment to work together to improve emergency response procedures.
  
  - Never end on a sour note.
-

# Post Incident Review



- Mobilization procedures for personnel and equipment;
  - Implementation plans and procedures
  - Management and coordination of emergency response
  - Stakeholder reaction
  - Internal and external communications
  - Post-incident perception
  - The short and long term consequences of the incident
-

# Record Keeping



- **the written O&M plan**
- **building plans and drawings**
- **survey data**
- **copies of notification and warning programs**
- **description, times, dates and attendants of training programs**
- **written respiratory protection program**
- **medical surveillance records**
- **copies of all permits and documentation of custodial, maintenance, renovation and emergency response actions performed**

# INVENTORY OF RESOURCES AND RECORD KEEPING



- Record keeping will be essential for triage, service availability, supply needs, social services and FEMA reimbursement.



# FEMA

# NPDES Review of Key Points for WWTP



## ■ WWTP Requirements

- ❑ O & M Manual
- ❑ Worker Safety
- ❑ Right to Know



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# Wastewater System local emergency planning process

- Wastewater officials need to be a part of the community police, fire, and hospital emergency response activities associated with the local emergency planning.



# NREPA Part 41 Sewerage Systems...Sec 324.4108

- (1) The department shall exercise **due care** to see that sewerage systems are properly planned, constructed, and operated to **prevent unlawful pollution** of the streams, lakes, and other water resources of the state.



Credit: Alan Cressler

# NREPA: Rule 59 Emergencies

- Rule 59. (1) If a breakdown of a sewerage system or system component or any emergency situation results in the diversion from or bypass of facilities necessary for the effective collection, transportation, or treatment of the wastes and in the discharge of pollutants in excess of those authorized by a discharge permit issued by the department under the act, then the system owner shall **take all necessary measures to correct the breakdown or emergency** and eliminate or reduce the discharge of excessive pollutants.



Credit: Alan Cressler

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# MIOSHA Act 154



- An employer shall: (General Duty Clause)
    - ❑ (a) Furnish to each employee, employment and a place of employment which is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to the employee.
    - ❑ (v) Any other criteria deemed applicable by the standards promulgating commission.
-

# MIOSA General Duty Clause



- The **General Duty Clause** has an important use for workers. Sometimes there is a hazard, but OSHA has no specific rule or standard dealing with it.
- Under the **General Duty Clause**, the employer has an obligation to protect workers from serious and recognized workplace hazards even where there is no standard.
- Employers must take whatever abatement actions are feasible to eliminate these hazards. If an employer fails to do this, OSHA can inspect and issue a citation under the **General Duty Clause**.

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# Michigan Emergency Management Act (Act 390)

- The **Michigan Emergency Management Act** (Act 390) provides for planning, mitigation, response, and recovery from natural and human-made disasters within the state.
  - It requires the state to develop an emergency response plan, and counties and large municipalities to develop an emergency operations plan.
  - LEPCs must coordinate their off-site emergency response plans with the county/city emergency operations plan.
-

# Pitfalls in Emergency Management



- **1. Lack of viable disaster plan:** Planning provides the foundation and blueprint for all emergency response actions. Managers should ensure plans are up to date and include accurate contact information.
- **2. Lack of disaster resources:** Emergency managers must be aware of all the specialized resources that are available and their limitations. Improper use and designation of resources ranks high as a major complication in disaster operations.
- **3. Lack of visible leadership:** As a disaster intensifies, fewer individuals will voluntarily step forward to assume a leadership role. Emergency managers should identify and assign leadership positions during the planning process. This will allow time for training and procedural familiarity.
- **4. Bad decisions make the situation worse:** Emergency managers must have a comprehensive understanding of the emergency situation based on accurate information. They cannot allow ineffective response actions and misinformation to derail a response.
- **5. Trying to obtain too much information, while neglecting the information flow:** Information flow, both incoming and outgoing, should be regulated and monitored frequently by the emergency manager to ensure the necessary and accurate information is being communicated.
- **6. Focusing on the insignificant:** Identify the key issues and prioritize according to your response objectives.
- **7. Unknown Operations Staff:** Identify key response personnel and resources before an incident occurs and understand individual capabilities and responsibilities.





# Conclusions



- While a number of federal regulations dealing with the protection of the U.S. water systems have been issued since 2001.
- Few direct mandates have been issued to the drinking water industry and none have been issued to the wastewater industry.

# Conclusions



- The only federal mandates have been a one time requirement for drinking water systems serving more than 3300 people to conduct a VA and a one time requirement for these utilities to prepare or update an ERP.
- The absence of security mandates may continue unless a significant **malevolent event** directed at a water or wastewater utility occurs.



CRISIS



## Prepared for all hazards

- Natural Incidents
- CHEMICAL
- BIOLOGICAL
- RADIOLOGICAL
- NUCLEAR
- EXPLOSIVE
- CYBER

