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Introduction to Water Quality

AWMA Midwest

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History of Our Water Quality

- > During the period prior to and up through 1970's
 - ❖ Water pollution was very visible, as an example
 - ◆ Cuyahoga River
 - Discharges into Lake Erie through the city of Cleveland
 - ◆ Lake Erie
 - One of the largest fresh water lakes in the North American continent

Cuyahoga River prior to the 1960s



Cuyahoga River in 1969



Lake Erie in the 1960s



Detroit, Michigan - This sign, warning of polluted water in Lake Erie near Detroit, didn't discourage these bathers from frolicking in the Lake waters. August 1962

Lake Erie in the 1970s



History of Clean Water Program

- > 1899 Rivers and Harbors Act
 - ❖ Navigation
- > 1948 Federal Water Pollution Control Act (FWPCA)
 - ❖ Navigation & human health concerns
- > 1965 Water Quality Act
 - ❖ Required standards for interstate waters
- > 1970 Executive Order - EPA Established
- > 1970 Refuse Act Permit Program
 - ❖ States worked with Army Corps prepare effluent quality and receiving water quality standards
- > 1972 FWPCA Amendments
 - ❖ Restore and maintain the chemical, physical, and biological integrity of our Nation's waters
 - ❖ Eliminate the discharge of pollutants to navigable waters by 1985
 - ❖ Development of the program core as we know it today

History of Clean Water Program

- > 1977 Clean Water Act (CWA)
 - ❖ Focused on priority pollutants and effluent guidelines
 - ◆ 65 categories
 - ◆ 126 pollutants
 - ◆ List of 21 primary industries
 - ◆ Pretreatment programs
- > 1987 Water Quality Act
 - ❖ Focused on storm water permitting
 - ❖ Federal sludge management program
 - ❖ Renewed emphasis of surface water toxics control
 - ❖ Water quality standards are specific to the water body (receiving water)
- > 1990 Storm Water Program
 - ❖ Phase I - Medium and large municipal separate storm sewer systems (MS4s) & including large construction activity greater than 5 acres (Effective 1990)
 - ❖ Phase II - Small MS4s and small construction activity less than 5 or 1 acre

Discharge Terms

> Direct Discharger

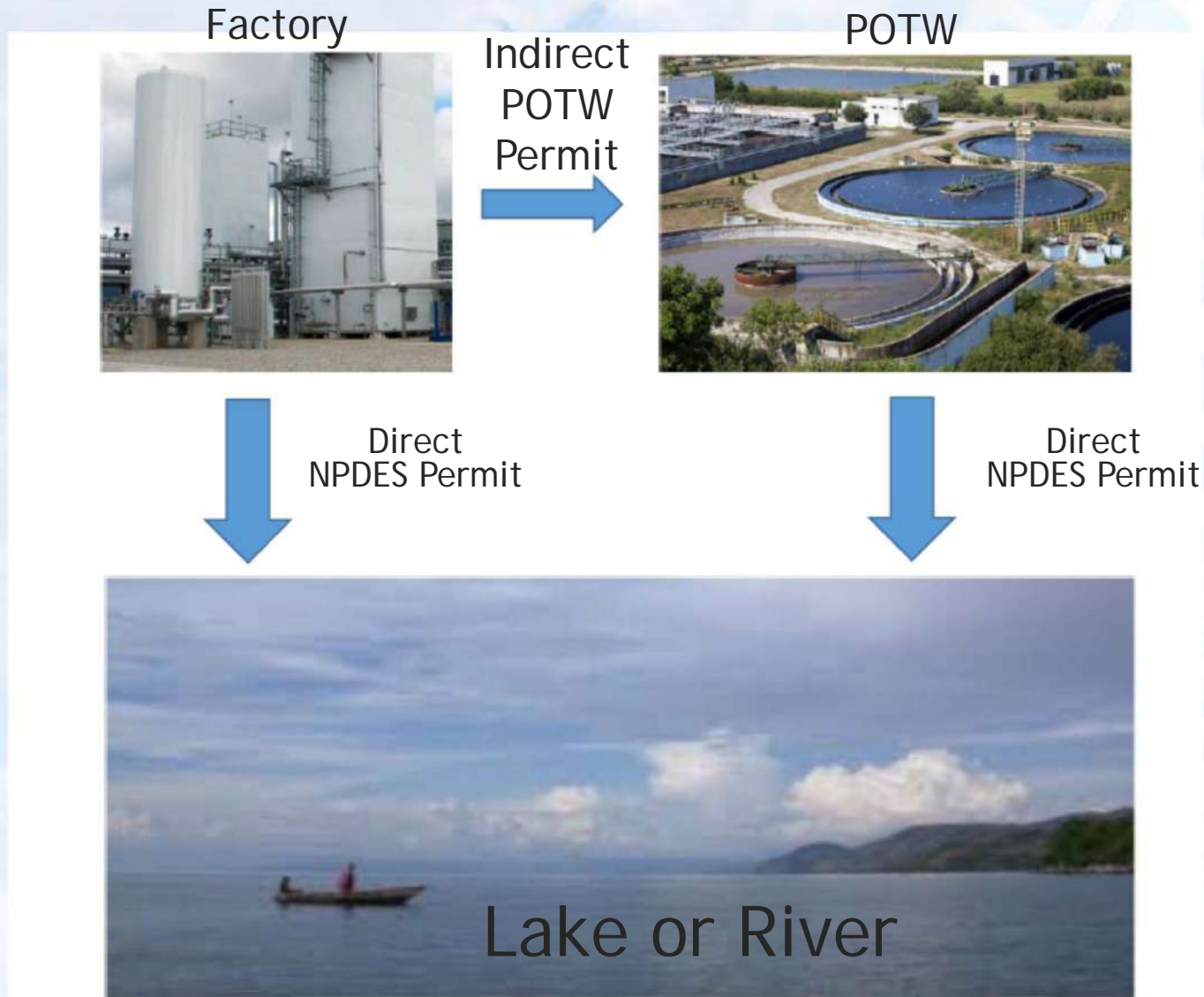
- ❖ Discharge to surface waters of the United States, e.g. rivers, streams, lakes
- ❖ Requires an NPDES permit

> Indirect Discharger

- ❖ Discharge to a local, city owned wastewater treatment plant, e.g. Publicly Owned Treatment Works (POTW)
 - ◆ Permit required if industrial/process wastewater discharged to the POTW
- ❖ Sanitary and industrial wastewater

> A facility can have both direct and indirect discharge permits

Direct vs Indirect Discharges



NPDES Statutory Framework

All point sources
discharging
pollutants into
waters of the United
States
(Direct Discharge)



Must obtain an NPDES
permit from EPA or an
authorized state,
territory, or tribe

NPDES - National Pollutant Discharge Elimination System

*An NPDES permit is a license to discharge and can be
revoked for cause*

CWA Classes of Pollutants

- > Conventional pollutants
 - ❖ BOD (Biological Oxygen Demand), TSS (Total Suspended Solids), pH, fecal coliform, and oil & greases
- > Toxic Pollutants - 126 priority pollutants
 - ❖ Heavy metals (e.g. Cu, Pb, Hg)
 - ❖ Organic compounds (e.g. PCBs, dioxin)
- > Nonconventional pollutants
 - ❖ Everything else
 - ◆ Chlorine, ammonia, nitrogen, phosphorous

Waters of the United States

What's Covered

- > Rivers and streams
- > Lakes and ponds
- > Sloughs
- > Prairie potholes
- > Intermittent streams
- > Territorial seas
- > Certain types of wetlands
- > Etc.

What's Not Covered

- > Certain artificially irrigated areas
- > Many agricultural and roadside ditches
- > Artificial lakes or ponds, including farm and stock ponds

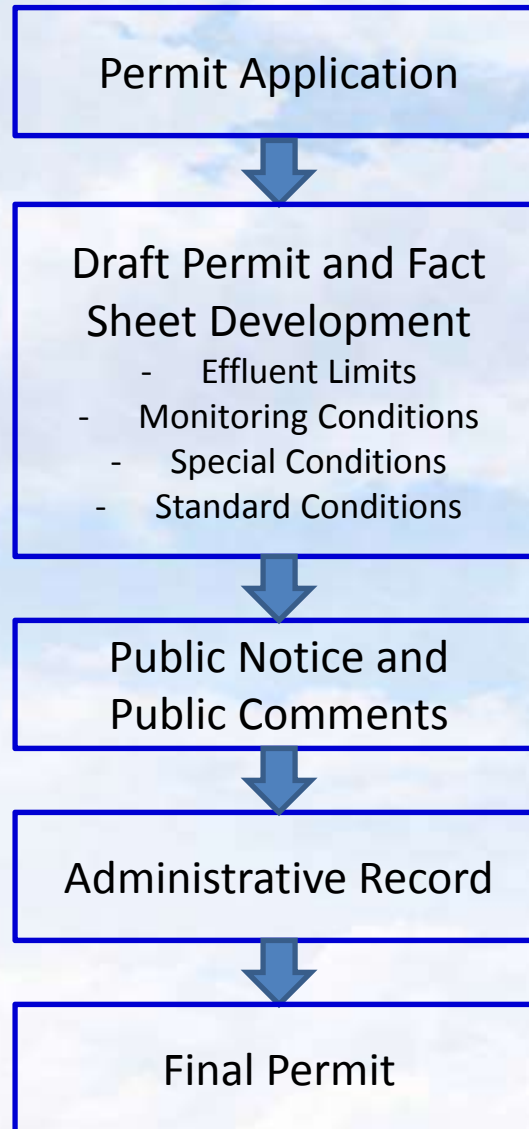
What about groundwater?

- > Ground water generally not itself considered “waters of the United States”
- > Discharges affecting ground water may be regulated as NPDES discharges if there is a direct hydrological connection to surface water
- > Ground water may be waters of the state/territory/tribe

General Definitions

- > Clean Water Act (CWA)
 - ❖ Act of Congress (legislation)
- > NPDES Program
 - ❖ Agency (EPA or State)
 - ◆ Development/implementation of the regulations
 - ❖ Federal Register or the state process
 - ◆ Where rules are first proposed
 - ◆ Waiting period for comments (public and industry)
 - ◆ Then promulgated
- > Policy and guidance

Individual Permit Process

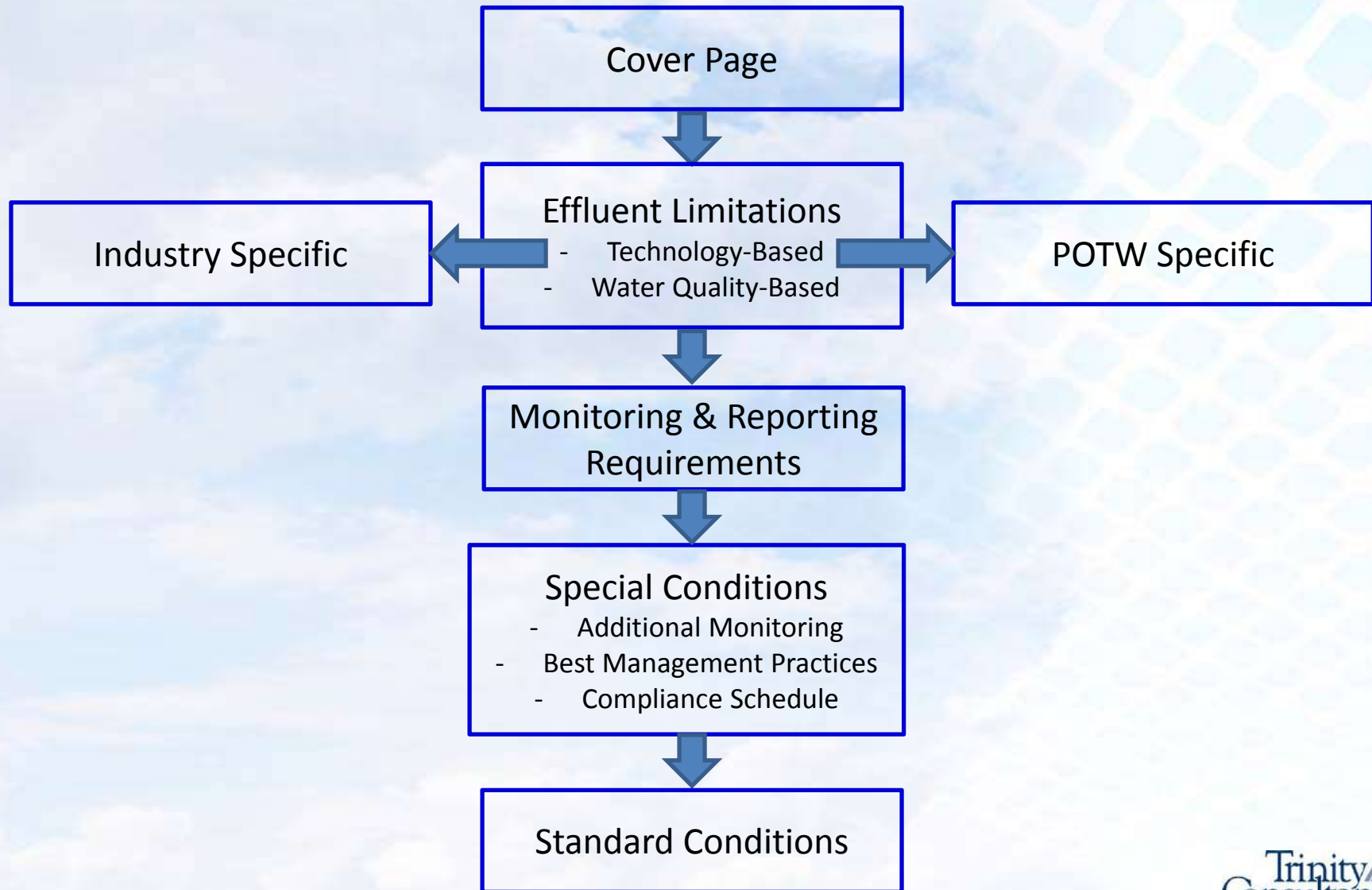


NPDES Permits

> Permit issuance process

- ❖ Facility submits an application
 - ◆ Use agency application forms
 - ◆ Distinguish new and existing discharges
 - ◆ Identify pollutants and parameters to be sampled
 - Provide calculations and water flow diagrams
 - Agency compares data to local standards
- ❖ Agency prepares a draft permit and fact sheet
 - ◆ Effluent limits
 - ◆ Monitoring conditions
 - ◆ Special Conditions
 - ◆ Standard conditions
- ❖ Public notice and comments
- ❖ Final permit

Permit Components



Permit Components *(1 of 3)*

- > Cover page
 - ❖ Summaries the operation of the facility
- > Effluent limitations
 - ❖ Technology-Based Effluent Limits (TBELs)
 - ◆ Establish performance-based level of pollutant controls
 - Conventional (BOD, TSS, Oil & Grease, pH, Fecal Coliform)
 - Non-conventional (chlorine, ammonia, nitrogen, COD, whole effluent toxicity (WET))
 - Toxic (priority) pollutants (126 metals and manmade organic compounds)
 - Provide equity among dischargers within categories
 - ❖ Water Quality-Based Effluent Limits (WQBELs)
 - ◆ Identifying Applicable Water Quality Standards
 - ◆ Characterizing the Effluent and Receiving Water
 - ◆ Determining the Need for Chemical-specific limits
- > Facility may be required to install a treatment process to meet the effluent limit
 - ❖ Physical
 - ◆ Sedimentation, filtration, oil/water separation, carbon adsorption, membrane filtration
 - ❖ Chemical
 - ◆ Oxidation/reduction, precipitation, pH control
 - ❖ Biological
 - ◆ Lagoons, sequential batch reactors (SBRs), rotating biological contactors (RBCs)
- > Besides conventional and nonconventional pollutant limits, the permit may limit
 - ❖ Temperature
 - ❖ Flow
 - ❖ Actual production at the facility

Permit Components *(2 of 3)*

> Monitoring & Reporting

- ❖ Inspections
 - ◆ Sampling/testing
 - ◆ Visual
- ❖ Discharge Monitoring Reports (DMRs)
 - ◆ Reporting test results
- ❖ Exceedance and/or Spill Reporting

> Special Conditions

- ❖ Site-specific special study
 - ◆ Evaluate/identify specific toxics, isolate source, control measures
- ❖ Posting outfall number & contact number at each outfall
- ❖ For POTWs
 - ◆ Prevent interference or pass-through
 - ◆ Accidental Slug or Toxic Plans

Permit Components *(3 of 3)*

> Standard Condition

- ❖ These conditions must appear in every NPDES permit
 - ◆ Duty to comply
 - ◆ Duty to reapply
 - ◆ Duty to mitigate
 - ◆ Proper O&M
 - ◆ Permit actions
 - ◆ Inspections and entry
 - ◆ Signatory requirements
 - ◆ Etc.

Storm Water (Normally Direct Discharge)

- > Two components for storm water discharges
 - ❖ Storm water:
 - ◆ Water that is on site that comes from rain or snow melt
 - ❖ Non-storm water:
 - ◆ Water that is on site that comes from everything but rain or snow melt such as water from:
 - Vehicle washing,
 - Dust control,
 - Irrigation,
 - Water line flushing,
 - Groundwater,
 - Sanitary discharge,
 - Condensate from air conditioning units,
 - Etc.

If storm water has the potential to be contaminated, a storm water permit is required

Discharge/Outfalls



Discharge/Outfalls



Discharge/Outfalls



Typical Storm Water Permit

- > State Permit Number and/or
 - ❖ Federal Permit Number
- > Permit limits:
 - ❖ Cooling Tower Blowdown Discharges,
 - ❖ Boiler Blowdown Discharges, &
 - ❖ Storm water pollution prevention plan (SWPPP), the requirements include;
 - Maintaining a written SWPPP,
 - Best Management Practices (BMPs)
 - Inspections,
 - Training,
 - Certifications, and
 - Other Requirements

Requirements for the SWPP Plan *(1 of 2)*

- > Develop & Implement a Storm Water Pollution Prevention Plan (SWPPP)
- > Elements of the plan include:
 - ❖ Pollution Prevention Team
 - ❖ Site Map (Outfall locations)
 - ❖ Material Inventory
 - ❖ Description of Exposed Significant Materials
 - ❖ Identification of Past Significant Spills

Requirements for the SWPP Plan *(2 of 2)*

- > Elements of the plan include:
 - ❖ Certification
 - ❖ Notification Procedures
 - ◆ Non-compliance, DMR reporting, etc.
 - ❖ Monitoring Data
 - ❖ Annual Facility Evaluation/Certification
 - ❖ Best Management Practices (BMPs)
 - ◆ Good Housekeeping
 - ◆ Preventive Maintenance
 - Reoccurring equipment inspections
 - ❖ Training
 - ❖ Changes to the Plan

Does Housekeeping Matter?



Storage Areas Inside Buildings



Does this look good to you?

BMPs - Good Housekeeping



BMPs - Good Housekeeping



Good Housekeeping



Best Management Practices (BMPs)

> Good Housekeeping



Good BMP - Examples of Properly Maintained Outside Storage Containers



Why Cover Trash Dumpsters?



Rainfall events or animals



Indirect Discharges

- > Industrial facility discharging wastewater to a city owned POTW
 - ❖ Typically sanitary systems
 - ❖ Industrial process wastewater
- > The city POTW must have a permit to discharge to the waters of the state
 - ❖ Most POTWs require industrial facilities to have permits to discharge to the POTW
 - ❖ POTW permitting process similar to NPDES program
 - ❖ *Permits required to prevent industry from impacting the POTW NPDES Permit Conditions!*

POTW



Antidegradation Policy

- > Required Policy
 - ❖ Protects the quality of the receiving water
- > The 1985 goal was to make all waters swimmable and fishable
- > Consists of a water pollution control review
 - ❖ Ensures technologically and economically feasible pollutant control measures are implemented
 - ❖ Required for new discharges or changes to existing discharges

Monongahela Oil Spill



In 1988, a 1,000,000 gallon diesel fuel spill that traveled 33 miles and impacted five municipal water supplies

Impact of this spill

- > Created the Oil Pollution Act (OPA) of 1990
 - ❖ Amended the CWA to require large oil storage facilities to prepare Facility Response Plans (FRPs)
- > This spill event also triggered EPA to revisit the 1973 oil spill regulations, thus formed an spill prevention, control, and countermeasure (SPCC) plan Task Force
 - ❖ The SPCC Task Force finalized the oil pollution prevention amendments in 2002

Definition of "Oil"



Oil of any kind or in any form, including but not limited to animal fats and oils, vegetable oil, petroleum, fuel oil, sludge, synthetic oils, mineral oils, oil refuse, or oil mixed with other wastes

Development of the SPCC Plan

- > Facility has an aggregate aboveground oil storage capacity of more than 1,320 gallons; and
- > Oil can be reasonably expected to enter into navigable waters
- > The SPCC Plan must include the following;
 - ❖ Spill Prevention -
 - ◆ Installation of required equipment, timely repair of malfunctioning systems, regular inspections and good oil handling/fueling practices (operating procedures)
 - ❖ Spill Control -
 - ◆ Achieved through monitoring of systems, proper reporting, and ensuring containment systems functional
 - ❖ Spill Countermeasures -
 - ◆ Achieved through quick spill response

Training Goals

- > Review with employees involved with the oil handling, transfer, storage, spill response or maintenance of oil equipment
- > Training at least annually
 - ❖ *Training must be documented, use sign-in sheets*
- > Additional training required if significant change
- > Training of new employees assigned to oil related duties.

Areas Impacted by the Plan

- > Emergency Fire Pump
 - ❖ Fuel oil tanks for the emergency engines
 - ❖ Fuel truck unloading areas
- > Yard Tractor
 - ❖ Aboveground fuel oil tank
 - ❖ Hose (must be kept within containment after use)
- > Maintenance Shop
 - ❖ 55-gallon drums of lube oil
- > Hot Oil System
 - ❖ 2,000 gallons of oil
- > Warehouse
 - ❖ Storage of 55-gallon drums of oil (unloading point)
- > Storage tanks
 - ❖ Raw material products that EPA considers to be oil
 - ❖ Gasoline, Kerosene, Naphtha, mineral spirits, vegetable oil, etc.
- > Etc.

55-gallon Drums

- Monthly Inspections required for the drums stored outside
- Drums stored outside to be elevated off ground
- Drums located within building are contained, no inspections required
- The appearance of ALL drums to be neat and clean
- Records of inspections to be kept for 3 years
- Spilled oil to be cleaned up immediately, use sorbent material and disposed



Fuel Oil Containment Area



Purpose of the SPCC amendments is to prevent this!

Goal - Prevention



What Do the Water Quality Regulations Mean in Plain English?

- > “Only Rain in The Drain to the Surface Water”
 - ❖ No Oil
 - ❖ No Sediment
 - ❖ No Run Off From Equipment
 - ❖ No Contaminated Water Discharged from Secondary Containment Areas
- > ... Only clean water in the Drain



Who relies on clean water?

> ALL the essential elements of life depend on clean water

❖ Such As Plants



Fish

Who relies on clean water?



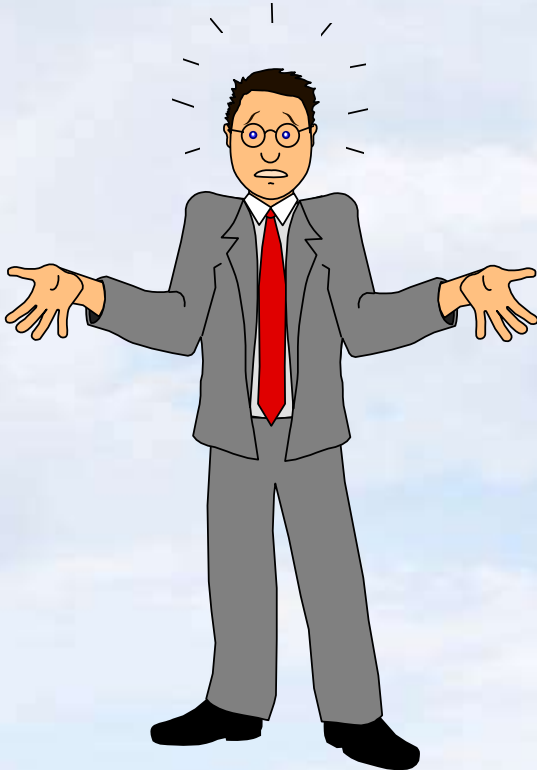
Livestock

All of these depend on clean water for their existence.

And People such as
YOU & ME



Questions?



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