

# Shipyards Pollutant Sources and Loading

Pollution Pathway Analysis and  
Best Management Practices  
Development

# Shipyards Stormwater Pollution



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# Shipyard Pollutant Sources and Loading

## ➤ Shipyard Sources of Pollutants

- Facility Operational Sources
  - A series of processes perform in a specific sequence necessary to obtain a specific result.
- Non-Facility Operational sources
  - Sources of pollutants derived from sources occurring outside of the facility.

# Shipyard Stormwater Pollution

- Difficult to characterize.
- Monitoring information often is not informative.
- Shipyard pollutants tend to be a “moving” target.
- Is there a way to get your arms around the problem?

# Shipyards Pollutant Sources and Loading

## ➤ Pollution Pathway Analysis

- A systematic method to characterize sources of pollutants and estimate their loading.
- Can be applied to any type of discharge.
  - Stormwater
  - Process waters

# Shipyards Pollutant Sources and Loading

- PPA is a set of analytical tools, that when properly applied can:
  - Identify the major sources of pollutants.
    - By Type
    - By Area
    - By Discharge
  - Prioritize pollution control efforts.

# Shipyards Pollutant Sources and Loading

## ➤ Benefits of PPA

- Identification of appropriate and effective BMPs or other pollution control processes.
- Reduction or elimination of the discharge of pollutants of concern.
- Reduced costs to implement pollution control measures.
- Increased ability to meet environmental and compliance goals.

# Shipyard Pollutant Sources and Loading

## ➤ Pollution Pathway Analysis

- Three steps:
  - Identify sources of pollutants.
  - Estimate potential loading of pollutants.
  - Determine potential pathways of pollutants to the environment.

# Shipyards Pollutant Sources and Loading

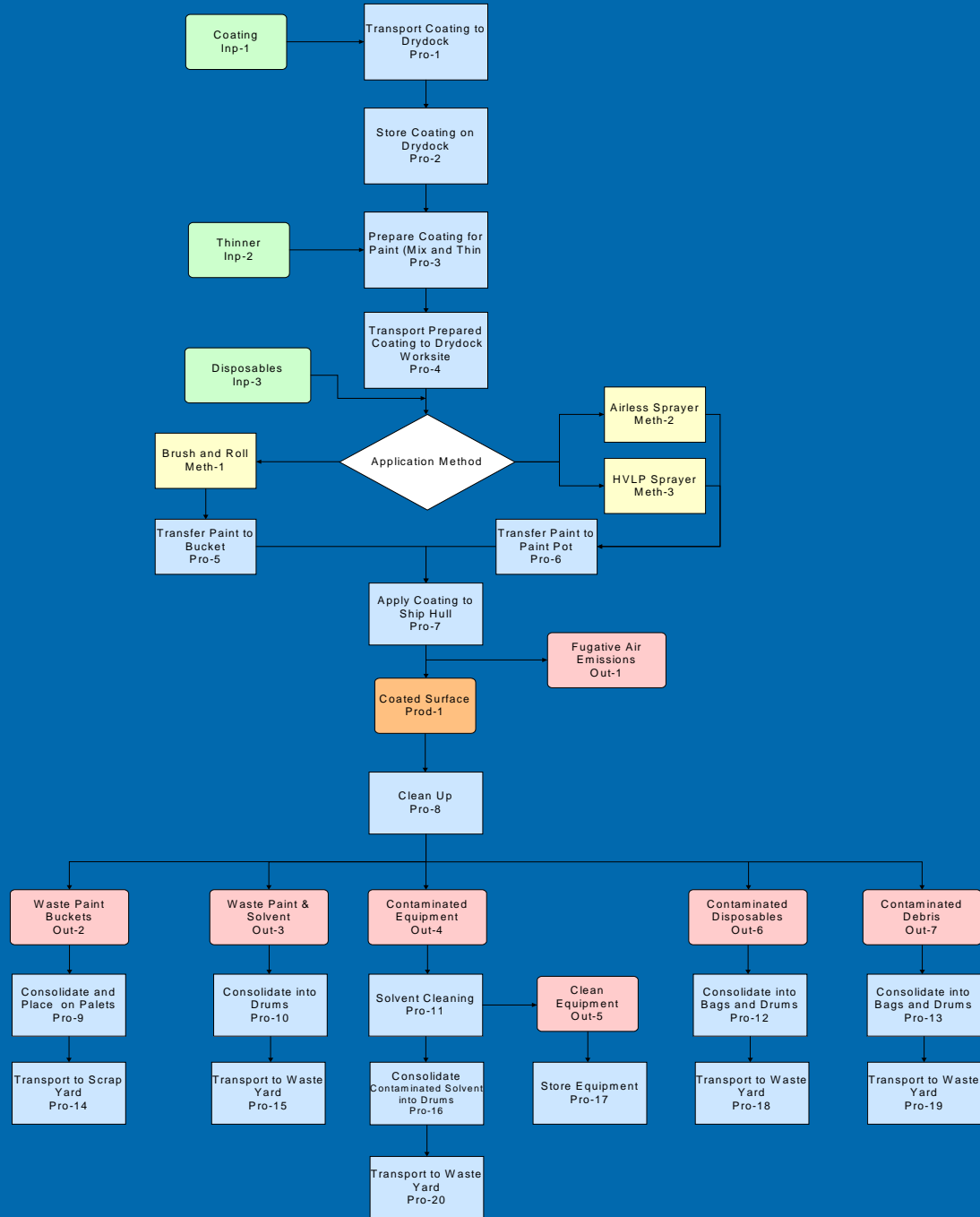


# Shipyard Pollutant Sources and Loading

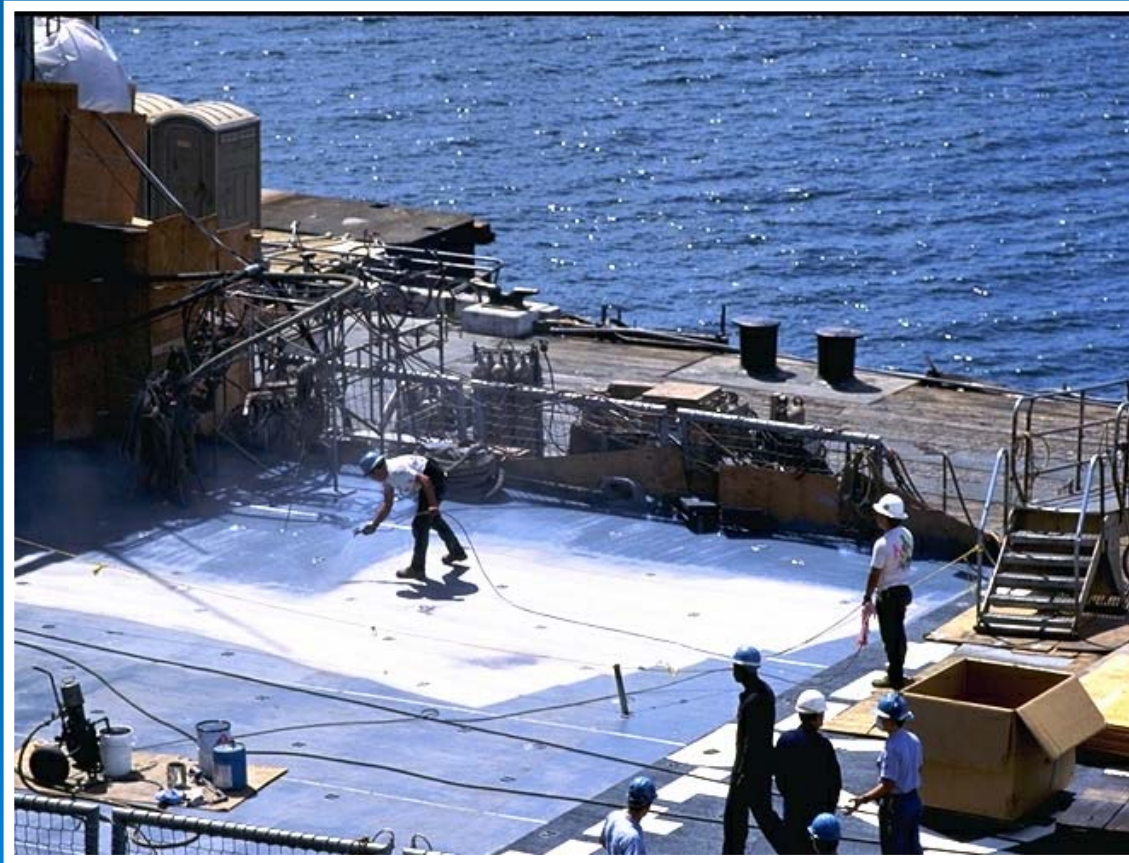
## ➤ Source Identification

- List the Operations.
- Flowchart the processes for each operation.
- Identify the potential sources of pollutants for each processes and/or for each pollutant.

# Coating Application in Floating Drydock



# Shipyards Pollutant Sources and Loading



TITLE:

Pollution Pathway Analysis - Operation/Process and Pollutants

DATE: 7/15/2002

TIME: 5:14:27 PM

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OF 1

PGS

Operation: AF Coating Application

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Process: Application of coating using airless sprayers

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Location: Drydock

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Emission point: Spray gun

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Material Inputs: Antifoulant Coating containing cuprous oxide and other metals

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Description of Process Resulting in Emissions: Spray painting results in significant amounts of overspray particulates that contain metals. These particulates can deposit on the facility where they are exposed to rainfall.

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Pollutants Generated: Copper and other metals.

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Comments: Average transfer efficiency of airless sprayers on ship's hull is 50 to 75 percent. This means 50 to 25 % to the total volume of the paint sprayed is lost as overspray.

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# Shipyard Pollutant Sources and Loading

## ➤ Estimate Pollutant Loading

- Necessary to prioritize sources of pollutant(s) of concern.
- Identifies what sources should be controlled.
- Eliminates non or insignificant sources from consideration.

# Shipyard Pollutant Sources and Loading

- Estimate Pollutant Loading
  - Mass balance equations.
  - Pollutant Emission Factors.
  - Characteristic Knowledge of Operations and Processes.

# TITLE: Pollution Pathway Analysis - Mass Discharge Estimate

DATE: 7/24/2002

TIME: 3:07:31 PM

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PGS

Process: AF Coating Application

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Estimated Material(s) Usage: 4,000 gallons AF coating applied per year @ 16.9 lbs/gallon = 67,600 AF lbs/year.

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Material Composition: 50% by wt cuprous oxide, 20% by wt. zinc oxide.

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Emission Calculations:

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Average annual transfer efficiency of airless paint spraying at shipyard = 60%

Average annual overspray of AF coating = 40%

Therefore:

67,600 lbs of AF Coating X 40% overspray = 27,040 lbs/year of AF Coating Overspray.

Stormwater Discharge Calculations:

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Assume 50% of overspray generated is retained on the facility.

Assume 10% of overspray on facility is lost to stormwater annually.

Therefore:

27,040 lbs/year AF overspray X 50 % retained X 50% cuprous oxide content X 10% lost to stormwater = 6,76 lbs cuprous oxide discharge from AF Coating application process annually.

Stormwater Mass Discharge Estimate:

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Estimate stormwater mass discharge loading for Cuprous Oxide from AF coating application = 676 lbs

# Shipyard Pollutant Sources and Loading

## ➤ Pollution Pathways

- How does the pollutant get to the environment?
  - Physical pathways
  - Transport Mechanisms
- Each step in the pathway must be identified.

TITLE:

# Pollution Pathway Analysis - Pathway Identification

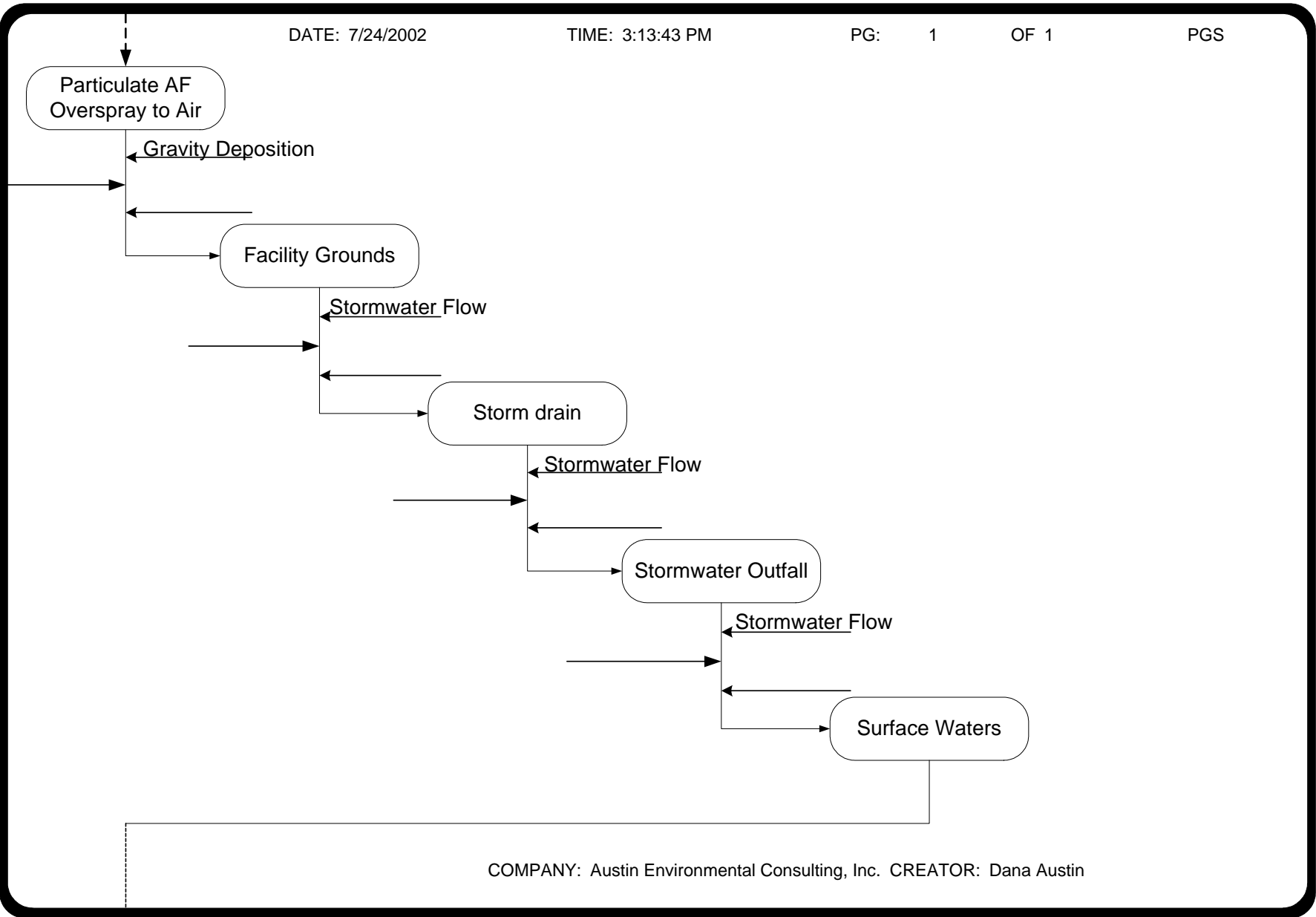
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OF 1

PGS



# Shipyard Pollutant Sources and Loading

## ➤ Pollution Pathways

- Pollution Pathway analysis can be used to determine where Best Management Practices can be most effectively applied.
- Where in Pathway can be pollutant be “blocked” from entering the environment?

TITLE:

# Pollution Pathway Analysis - Pathway Identification - BMP Map

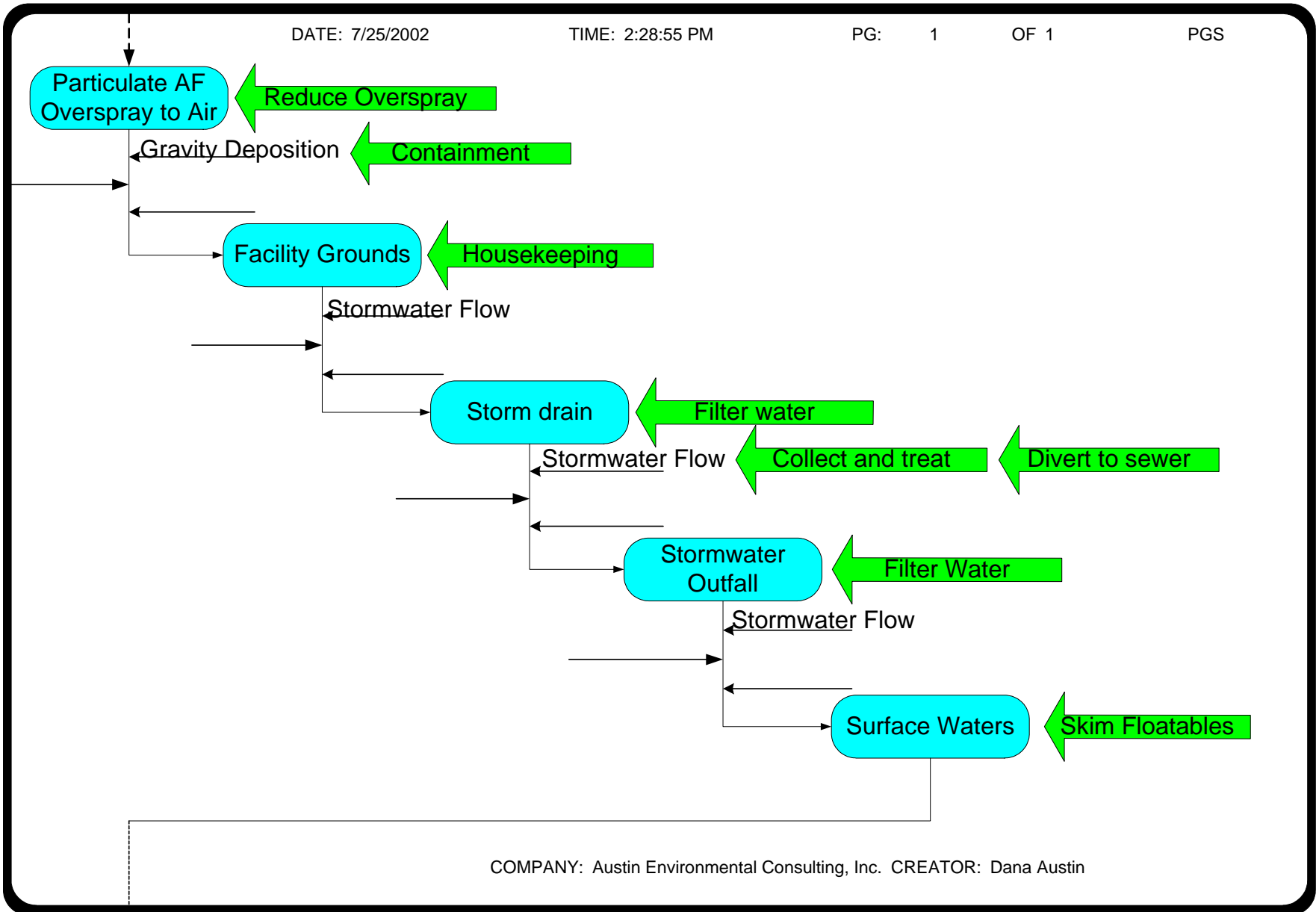
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# BMP Development

- BMP Development using PPA can be:
  - Developed in the General
    - By Industry Sector
    - By Operation and Process
  - Adapted in the Specific
    - Facility
    - Location
    - Operations

# BMP Development

➤ The Goal drives the BMP development.

- Zero discharge of copper from AF application.
  - Bush and roll all hull coatings.
  - Use 100% containment when spraying.
- 50 % reduction in overspray.
  - Wind controls when spraying.
  - Training program for painter.

# BMP Development from PPA

## ➤ Establish Goal of BMP

- Compliance with Regulatory Standard.
- Company Environmental Policy.
- Percentage reduction in pollutant loading.
- Community concerns.
- Risk Assessment.

TITLE:

# Pollution Pathway Analysis - Pathway Identification - BMP Map

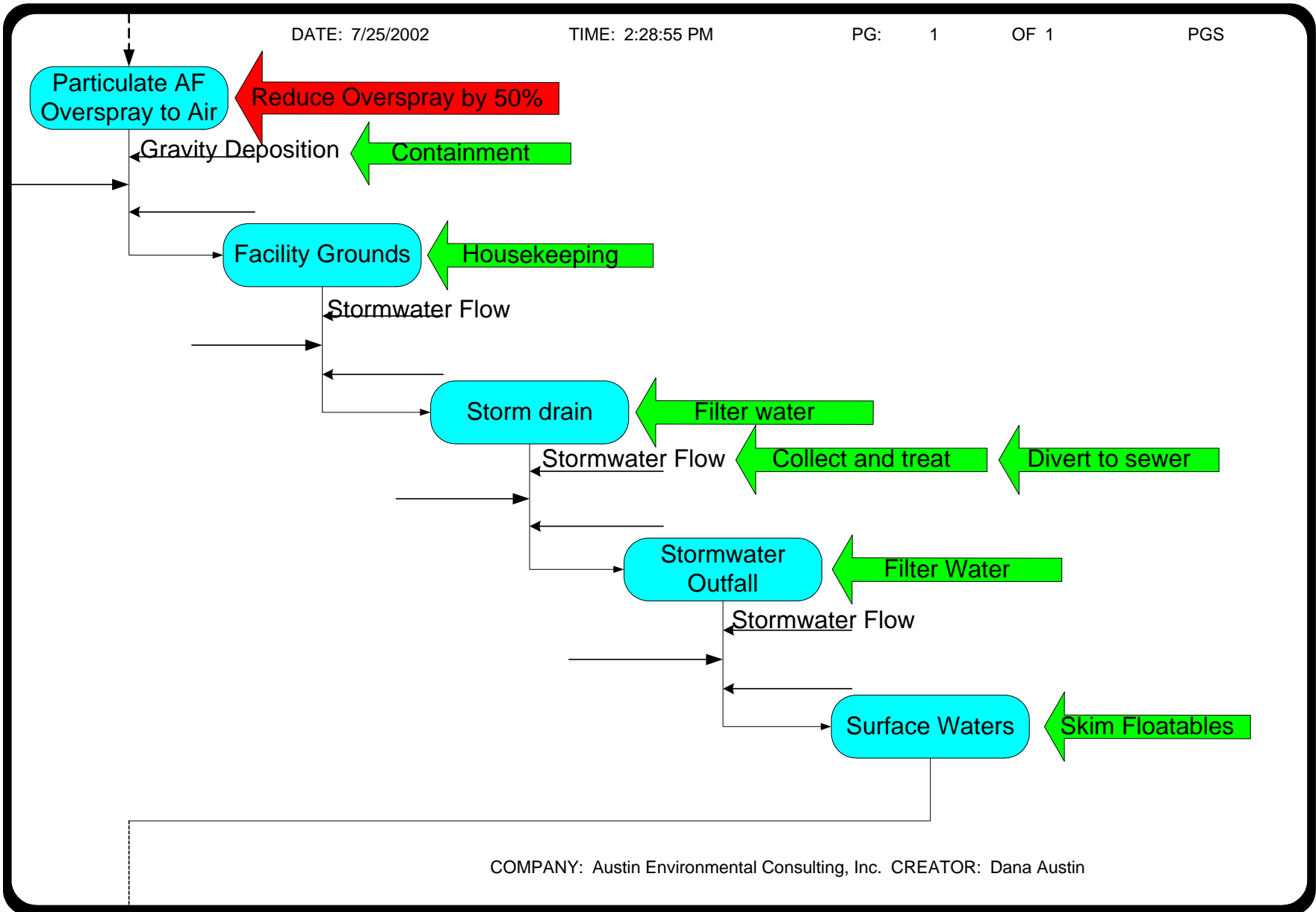
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# BMP Development from PPA

## ➤ AF Coating Overspray example

- Goal: Reduce copper loading from AF application overspray by 50%
- Whys to increase Transfer Efficiency
  - Don't paint on windy days.
  - Use better application techniques.
  - Wind screens to reduce wind speed.
  - Use HVLP sprayers

TITLE:

# Pollution Pathway Analysis - BMP Evaluation - Reduce Overspray

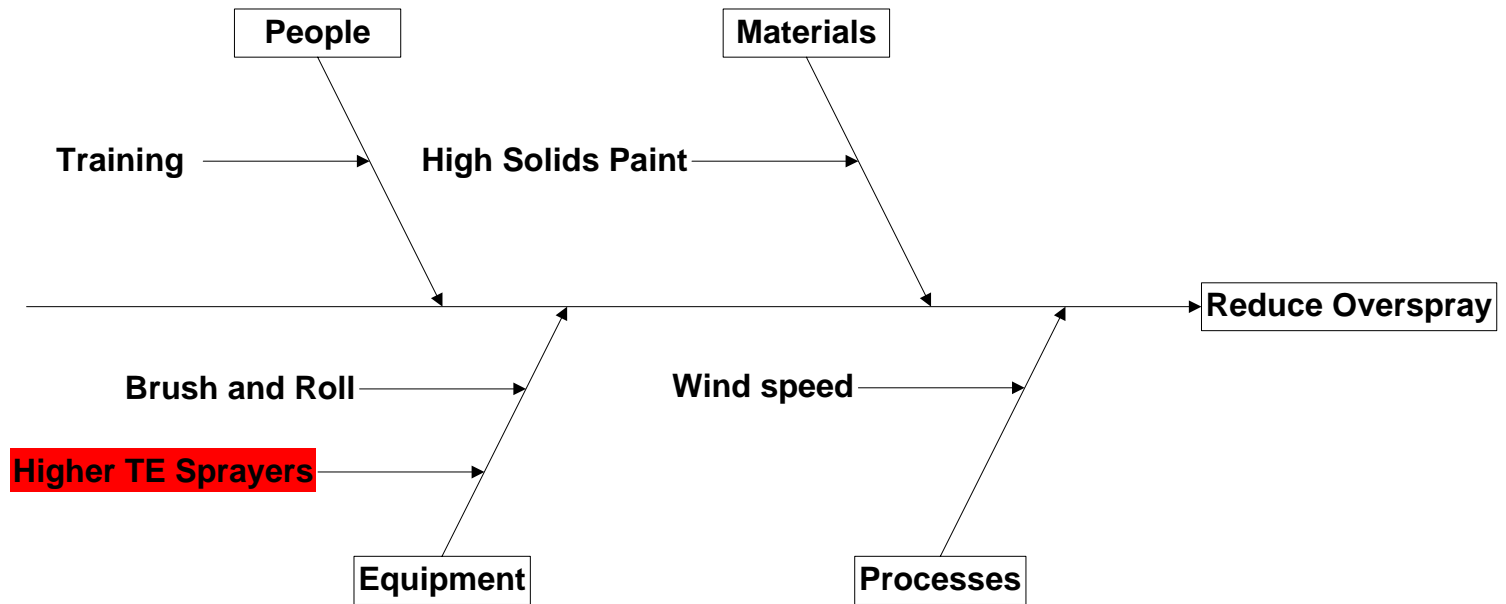
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TITLE: Advantages and Disadvantages - Low Pressure High Volume Paint Sprayers

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Advantages

Disadvantages

50% increase in average Transfer Efficiency

25% reduction coating required to achieve millage

Less man-hours to apply coating

Cost to buy new equipment

Increased PM Costs

May be difficult to use

# BMP Development

## ➤ BMP Elements

- Background information
  - Pollutant
  - Processes
  - Significant
- Description of Best Management Practice
  - What are you going to do.
  - When are you going to do it.
  - How are you going to do it.
  - Where are you going do it.
  - Who is going to do it.

# BMP Development

## ➤ BMP Elements

- Monitoring
  - What are you going measure.
  - How will you measure it.
  - When are you going measure it.
- Reporting
  - What are you going to report.
  - How are you going to report it.
  - When are you going to report it.

# BMP Development

## ➤ BMP Elements

- BMP Goals
  - What do you want to achieve.
  - Where are you starting from.
  - Process Milestones.
  - Time schedule to reach goal.

# Shipyard Stormwater Best Management Practices

## Antifoulant Coating Application

- 1) BMP 001: Antifoulant Coating Application
- 2) References:
  - a) PPA-1-AF Coating Application Form.
  - b) PPA-2-AF Coating Application Chart.
- 3) Background: Application of antifoulant coating systems to the exterior underwater hull of ship is a process commonly performed in the facility. Antifoulant coatings commonly contain high levels of inorganic copper and zinc, typically cuprous oxide and zinc oxide. Application of the coating to the ship's surface is accomplished using airless paint spraying equipment. During the spraying process and significant amount of coating "overspray" is generated. This overspray can settle on to facility surfaces where it can be exposed to rainfall. This results in increased levels of copper and zinc loading to the facility's stormwater discharges.
- 4) Best Management Practice: AF coating will be applied to ship's hull using equipment or methods that have an annual average transfer efficiency of 75% or greater. This can be obtained through the use of HVLP sprayers, worker training, restrictions on painting at high wind speeds greater than 15 mph, use of containment in the area of spray painting, paint application using bush and rollers, and others means.
- 5) Monitoring and Reporting: AF coating application transfer efficient will be calculated for work performed in the facility on a quarterly basis and reported annually, on July 31, to the local water board.
- 6) BMP Goal(s): The Goal of this BMP is achieve an average annual AF coating application transfer efficiency of 75% or greater, within 36 months.

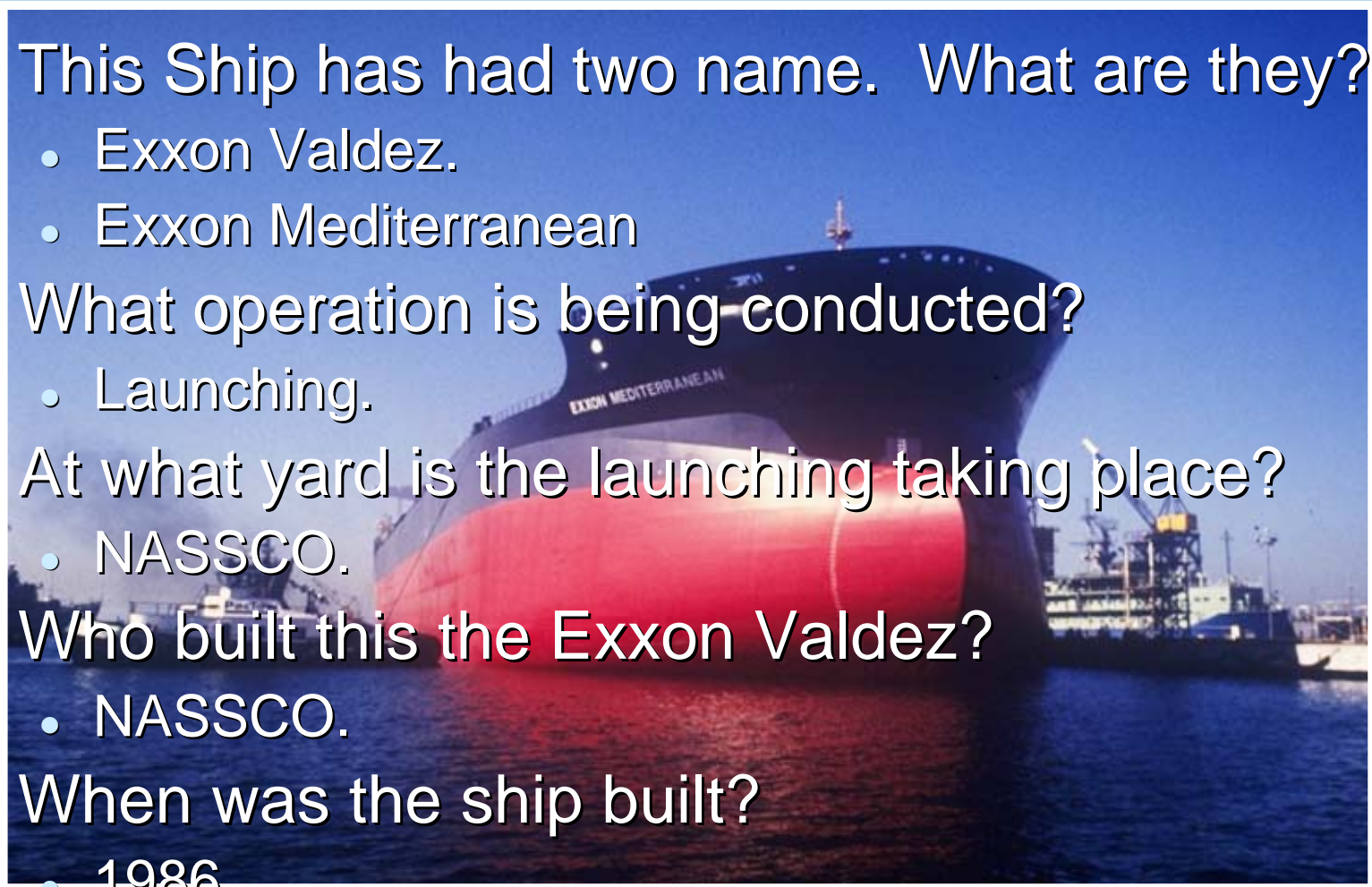
Progress milestone goals for average annual AF transfer efficiency are: 60% TE by the end of the first year, 70% TE by the end of the second year, and 75% TE by the end of the third year.

# Shipyard Pollutant Sources and Loading

## ➤ Summary

- BMP development using PPA
  - Adaptable to Shipyard “Job-Shop” environment.
  - Can reduce effort spent on implementing controls on sources that are not significant contributors.
  - Can effectively reduce the Shipyard’s impact on the environment.
  - Can be measured to determine practicality and cost effectiveness.

## •The Quiz:

- 
- This Ship has had two name. What are they?
    - Exxon Valdez.
    - Exxon Mediterranean
  - What operation is being conducted?
    - Launching.
  - At what yard is the launching taking place?
    - NASSCO.
  - Who built this the Exxon Valdez?
    - NASSCO.
  - When was the ship built?
    - 1986.