

# Module 16

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## STEP 8 Conduct Feasibility Study

# Objective:

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The module will discuss the following:

- ◆ What is the purpose of the feasibility study?
- ◆ What are the six steps of the planning process?
- ◆ How are plans evaluated?



# **Feasibility Study Purposes:**

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- ◆ Describe and evaluate alternative plans
- ◆ Describe in detail the recommended plan
- ◆ Develop a fully-funded baseline cost of the project
- ◆ Prepare a feasibility report

# Feasibility Report Purposes:

- ◆ Serves as a Decision Document to convince the Office of Management and Budget (OMB) of project viability
- ◆ Is an Authorization Document and is submitted to Congress for project authorization

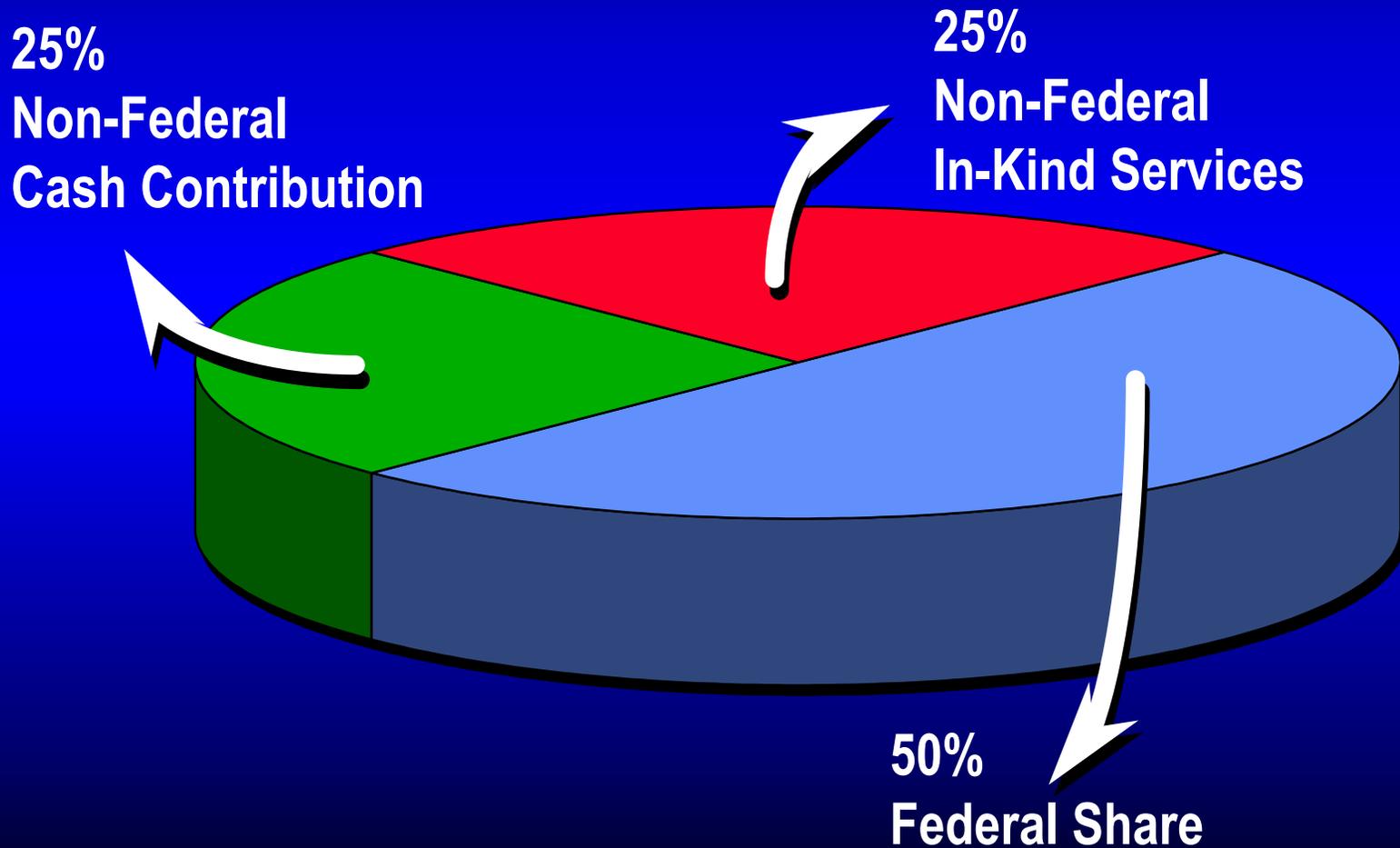
# Feasibility Phase - Cost Sharing:

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- ◆ Feasibility phase is cost shared equally between the Federal (Corps) and the non-Federal sponsor(s)
- ◆ EXCEPTION: Inland navigation and Section 216 projects are 100% Federally funded

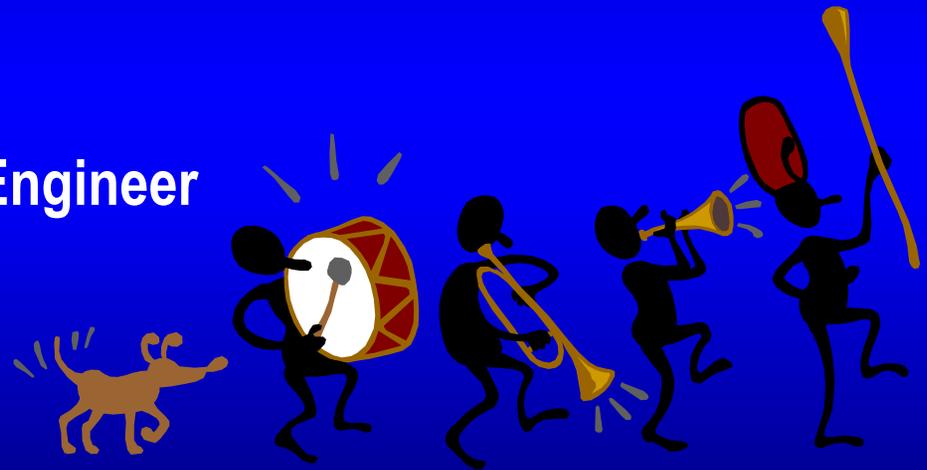


# FEASIBILITY PHASE COST SHARING



# Establishment of Study Team:

- ◆ Sponsor
- ◆ Project Manager, Technical Team Leader, Project Engineer
- ◆ Environmental Specialist
- ◆ Economist
- ◆ Real Estate Specialist
- ◆ Hydraulics/Hydrology Engineer
- ◆ Geotechnical Engineer
- ◆ Cost Estimator
- ◆ Office of Counsel
- ◆ Construction/Operations Staff



# Six Steps in Planning Process:

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- ◆ Step 1 - Problems and Opportunities
- ◆ Step 2 - Inventory and Forecast Resources
- ◆ Step 3 - Formulating Alternative Plans
- ◆ Step 4 - Evaluation of Alternative Plans
- ◆ Step 5 - Comparison of Alternative Plans
- ◆ Step 6 - Select Recommended Plan

**Project Planning**



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# STEP 1: Problems and Opportunities

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- ◆ Identify the setting:
  - ▼ Partnership
  - ▼ Planning area
  - ▼ Period of analysis
  - ▼ Interdisciplinary team
  - ▼ Stakeholders
  - ▼ Public scoping meeting
- ◆ Specific problems
- ◆ Specific opportunities
- ◆ Specify planning, goals, objectives,  
and constraints



# STEP 2: Inventory and Forecast Resources

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- ◆ Planning requires information
- ◆ External and internal factors influence the study environment
- ◆ Determine existing conditions
- ◆ Forecast conditions
- ◆ Establish Without Project Conditions!!



# STEP 3: Formulation of Alternative Plans

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- ◆ What is plan formulation?
- ◆ Generating “full” array of alternatives
- ◆ Principles and Guidelines (P&G)
  - ▼ Used as standard to formulate and evaluate alternative plans



# STEP 4: Evaluation of Alternative Plans

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- ◆ Screen alternatives
- ◆ Determine with and without project conditions
- ◆ Evaluate alternatives and present results



# EVALUATION OF PLANS

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# “PRINCIPLES AND GUIDELINES”

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- ◆ “Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies”
- ◆ Four “accounts” to evaluate effects of plans:
  - ▼ NED - National Economic Development
  - ▼ RED - Regional Economic Development
  - ▼ EQ - Environmental Quality
  - ▼ OSE - Other Social Effects

# EVALUATE PLANS ECONOMICALLY

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- ◆ Contributions to NED are the direct net benefits that accrue in the study area and the rest of the nation.
  - ▼ Flood damage reductions
  - ▼ Commercial navigation improvements
  - ▼ Environmental Restoration
  - ▼ Hydropower/recreation/et al

# EVALUATE PLANS ECONOMICALLY

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- ◆ Determine period of evaluation (typ. 50 or 100 years)
- ◆ Determine benefits of the project
  - ▼ NED benefits are beneficial increases in the economic value of the national output of goods and services



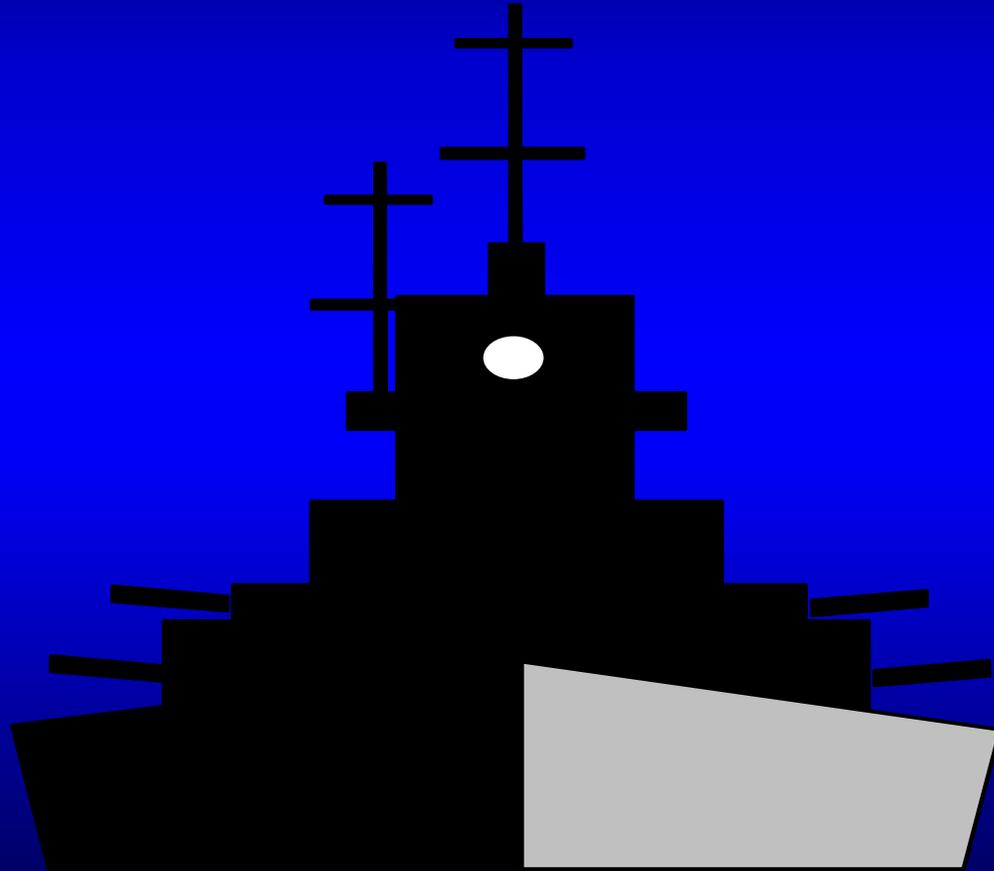
# NED ANALYSIS PROCESS

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- ◆ Calculate NED benefits and costs at a common point in time - such as the end of the installation period
- ◆ Convert this value to an average annual value
- ◆ Benefits are quantified for each alternative being evaluated

# NAVIGATION



# NED BENEFITS - NAVIGATION

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## Sample economic benefits for a navigation project

- ◆ Reduction in Transportation Costs
  - ▼ Economies of Scale
    - Use of Larger Vessels
    - Reduction in “light loading”
  - ▼ Shift of Transportation Mode or Origin
  - ▼ Reduction in Tidal Delays
  - ▼ Reduction in Lockage Delays
- ◆ Reduction to damages to commercial vessels

# NAVIGATION BENEFIT SAMPLE CALCULATION

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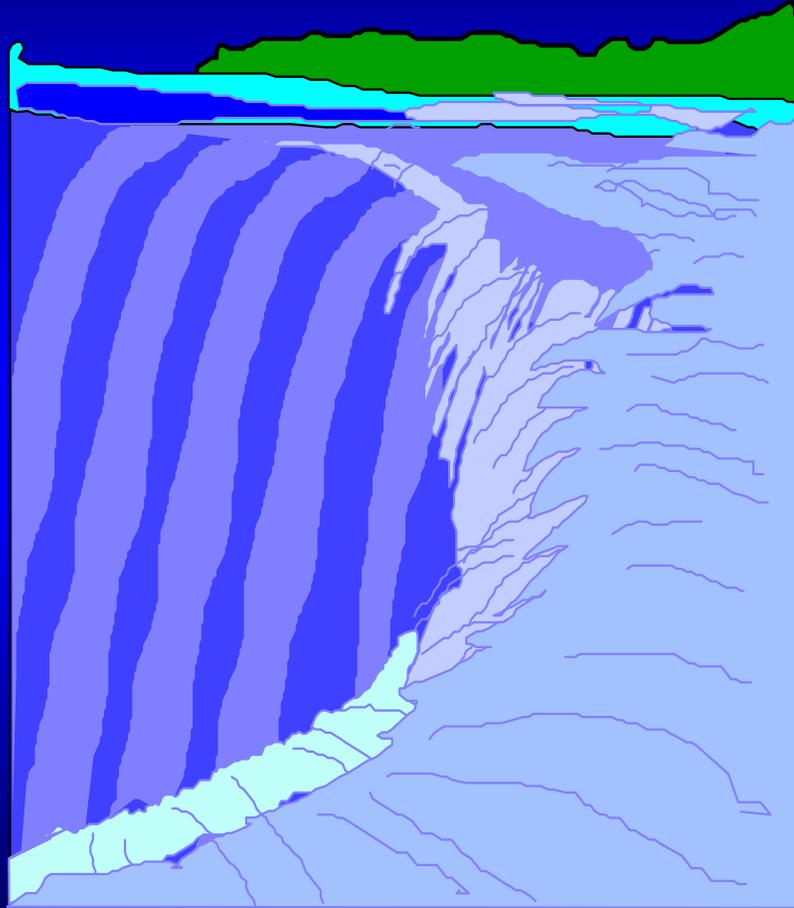
## Reduction in Transportation Cost - Tidal Delay

$(75 \text{ vessels}) \times (3 \text{ hours}) \times (\$300/\text{hour}) \times (45 \text{ days/year}) =$   
 $\$3,038,000$  reduction in transportation cost

## Economies of Scale - Light Loading

$(1,500 \text{ tons/ship}) \times (\$2 \text{ savings/ton}) \times (1000 \text{ ships/year}) =$   
 $\$3,000,000$  cost savings per year

# FLOOD CONTROL



# NED BENEFITS - FLOOD CONTROL

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## ◆ Inundation Reduction Benefits

### ▼ Types of Flood Damage

- Physical Damages

- Damages to residential and commercial structures and contents (typically the single largest benefit category)

- Loss or damage to roads, bridges, utilities, flood control structures

- Income Loss

- Emergency Costs

## ◆ Intensification/Location Benefits

# FLOOD CONTROL BENEFIT SAMPLE CALCULATION

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- ◆ **Inundation or flood damage reduction benefit**
  - ▼ (Expected Annual Damages under without project condition)
    - (Expected Annual damages under with project condition)
    - = (Reduction in expected annual flood damages)

	<u>Expected Annual \$</u>
Without Project Residential Damages	\$7,097,000
With Plan "A" Residential Damages (referred to as Residual Damages)	\$2,069,000
	<hr/>
Inundation Reduction Benefit	\$5,028,000

# ENVIRONMENTAL RESTORATION



# ECONOMIC EVALUATION ECOSYSTEM RESTORATION

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- ◆ EQ (Environmental Quality) benefits
- ◆ Non-monetary project benefits or outputs
- ◆ Environmental or ecosystem outputs must be measurable and quantified
- ◆ Outputs may be measured in a variety of ways:
  - ▼ Number of acres restored, linear feet of side-channel spawning areas
  - ▼ Index system such as HEP (Habitat Evaluation Procedure)
  - ▼ Proxy measure to reflect changes in functions & process, e.g.. increase in frequency of inundation

# ECONOMIC EVALUATION ECOSYSTEM RESTORATION

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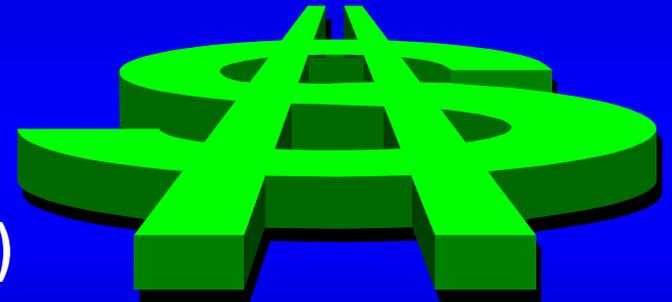


- ◆ Identify Relationship between changes in outputs and changes in costs. Completed through Cost Effectiveness and Incremental Cost Analysis
- ◆ No Monetary Benefit-to-Cost Ratio

# PROJECT COSTS

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- ◆ **Preconstruction, Engineering and Design (PED) Costs**
- ◆ **Construction Costs (M-CACES)**
- ◆ **Real Estate Costs (Gross Appraisals)**
- ◆ **Operation & Maintenance Costs**

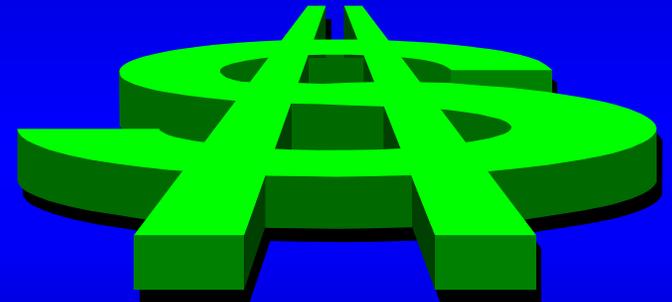


**[Convert these costs to annual costs for comparison]**

# PROJECT COSTS

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- ◆ Mobilize and Demobilize Dredge = \$900,000
- ◆ Dredge Channel = \$18.9 million
- ◆ Real Estate = \$6 million
- ◆ Plans and Specs. = \$900,000
- ◆ S&A = \$450,000
- ◆ FIRST COST TOTAL = \$27,170,000



- ◆ Annualized First Cost = \$2,218,000
- ◆ Annualized O&M = \$125,000
- ◆ Annual Cost = \$2,343,000

# Fully Funded Cost Estimate

- Project cost is first calculated for the base year of study and then fully funded (“inflated”) thru the end of project construction

# **SECTION 902 LIMITS**

**← Water Resources Development Act of 1986**

**← Established a maximum cost of a project**

- authorized project cost can not be increased by more than 20 percent (excluding inflation) without further Congressional authorization**

# NED PLAN

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**National Economic Development (NED) Plan =**

*Plan with the greatest net benefits!*

*[Net benefits = average annual benefits -  
average annual costs]*

# Economic Analysis

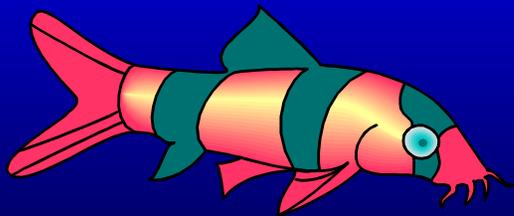
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	Annual Benefits	Annual Costs	BCR	Net Benefits
PLAN A	\$ 80,000	\$100,000	0.8	(\$20,000)
PLAN B	\$110,500	\$ 85,000	1.3	\$25,500
PLAN C	\$192,000	\$160,000	1.2	\$32,000

# Evaluate Plans Environmentally

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- ◆ Determine environmental impacts caused by the alternative plans
- ◆ Prepare NEPA (National Environmental Policy Act) documentation [EIS, EA/FONSI]



# STEP 5: Comparison of Alternative Plans

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- ◆ There are different methods for comparing alternatives and their effects:
  - ▼ Monetary Evaluation methods
  - ▼ Multi-criteria evaluation methods
  - ▼ Trade-off analysis
  - ▼ Goal achievement method



Table 34: Summary Comparison of Detailed Plans for Duck Creek, Ohio <sup>11</sup>

	No Action	NED Plan	Locally Preferred Plan
<b>1. PLAN DESCRIPTION</b>	No Action/Without Project Condition	Reach DC-A 25-year protection; Reach DC-B 600-year protection; & Reach DC-C 100 year protection	Sections DC-A, DC-B, DC-C Uniform 100-year level of protection
<b>2. IMPACT ASSESSMENT</b>			
<b>A. National Economic Development (NED)</b>			
(1) Project Cost	\$0	\$11,895,000	\$14,817,000
(2) Annual Cost	\$0	\$ 1,357,000	\$ 1,445,000
(3) Total Annual Benefits	\$0	\$ 1,721,000	\$ 1,783,000
(4) Annual Net Benefits	\$0	\$ 364,000	\$ 338,000
(5) Benefit to Cost Ratio	N/A Ranks 3rd	1.27 Ranks 1st	1.20 Ranks 2nd
<b>B. Environmental Quality (EQ)</b>			
(1) Air/Noise	Normal noise levels created by traffic, business, and industrial activities. Ranks 1st.	Temporary increased noise levels during 4-year construction period. Ranks 2nd.	Temporary increased noise levels during 6-year construction period. Ranks 3rd.
(2) Water Quality	Existing water quality is poor due to discharges into the stream from combined sewer systems outfalls and flood runoff from industrial areas adjacent to the stream. Ranks 1st.	Temporary increased turbidity levels during 4-year construction period. Contamination from flood runoff from adjacent industrial areas partially eliminated in DC-A, and fully eliminated in DC-B and DC-C. Ranks 2nd.	Temporary increased turbidity levels during 4-year construction period. Contamination from flood runoff from adjacent industrial areas eliminated for all reaches. Ranks 1st.
(3) Vegetation	Existing vegetation typical for streams in Southwest Ohio. Excellent habitat for woodland songbirds and urban wildlife. Ranks 1st.	Permanent loss of 12 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 2nd.	Permanent loss of 13 acres to project features; temporary loss of 8 acres during 4-year construction period. Ranks 3rd.
(4) Threatened & Endangered Species	No endangered species in work area.	No impact.	No impact.
(5) Aquatic Birds	Existing biological community sparse due to pollutant discharges from combined sewer systems outfalls. Ranks 3rd.	Temporary decreased bird populations during 4-year construction period. Possible increase in bird population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).	Temporary decreased bird populations during 4-year construction period. Possible increase in bird population with decrease in contaminant runoff from protected industrial areas. Ranks 1st (Tie).
(6) Cultural Resources & Historic Properties	No cultural resources or historic properties in work area.	No impact.	No impact.
<b>C. Regional Economic Development (RED)</b>	Same as National Economic Development (NED) impacts. Ranks 3rd.	Same as National Economic Development (NED) impacts. Ranks 1st.	Same as National Economic Development (NED) impacts. Ranks 2nd.

# STEP 6: Select Recommended Plan

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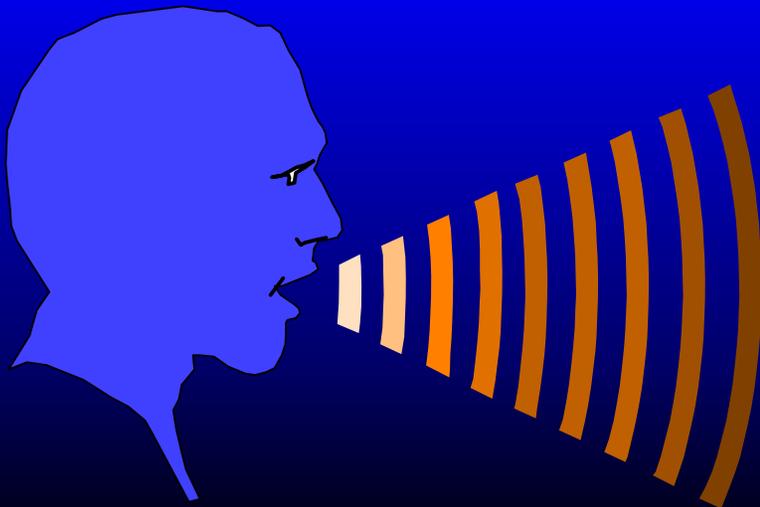
- ◆ Cost Effective - Consider the NED analysis:
  - ▼ Always recommend NED Plan unless there is a locally preferred plan (LPP)
  - ▼ LPP recommendation requires ASA(CW) concurrence
  - ▼ Sponsors typically pay increased costs above NED Plan
- ◆ Environmentally sound
- ◆ Technically feasible
- ◆ Socially/Politically Acceptable



# Public Involvement:

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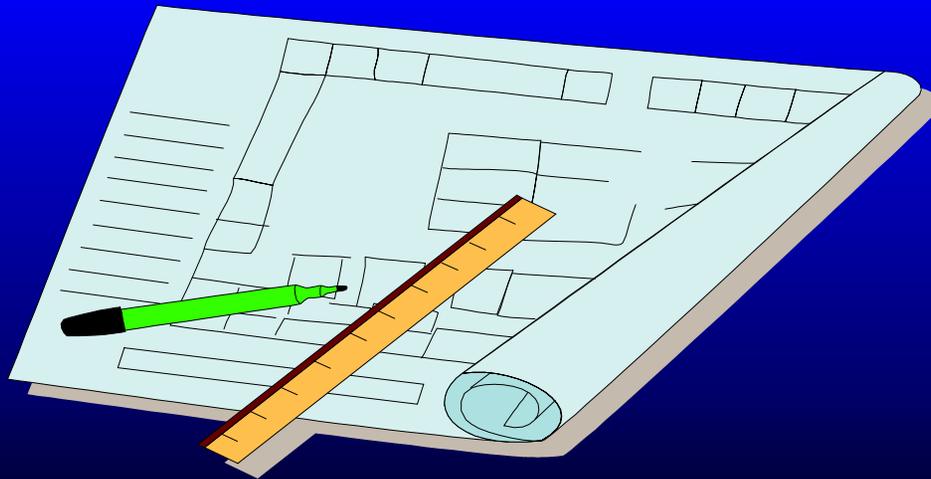
- ◆ Hold meetings with residents, businesses, local governments, special interests
- ◆ Hold public meetings/workshops
- ◆ Distribute newsletters



# Detailed Design:

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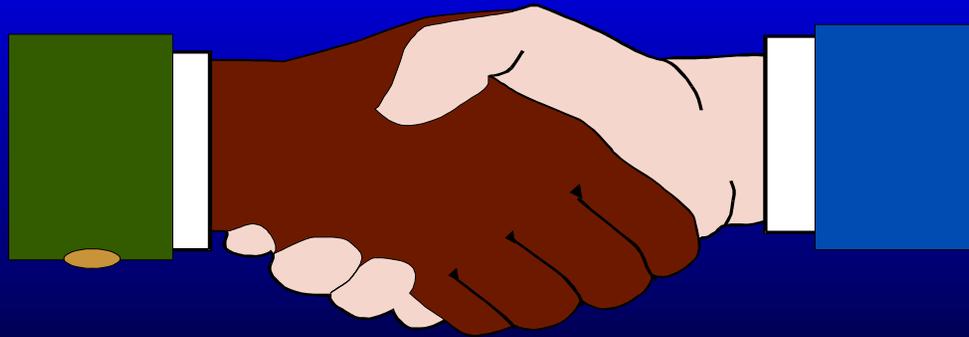
- ◆ Once a recommended plan is determined, Engineering Division does the more detailed project design.
- ◆ Engineering Technical Appendices are prepared.



# Identify Sponsor:

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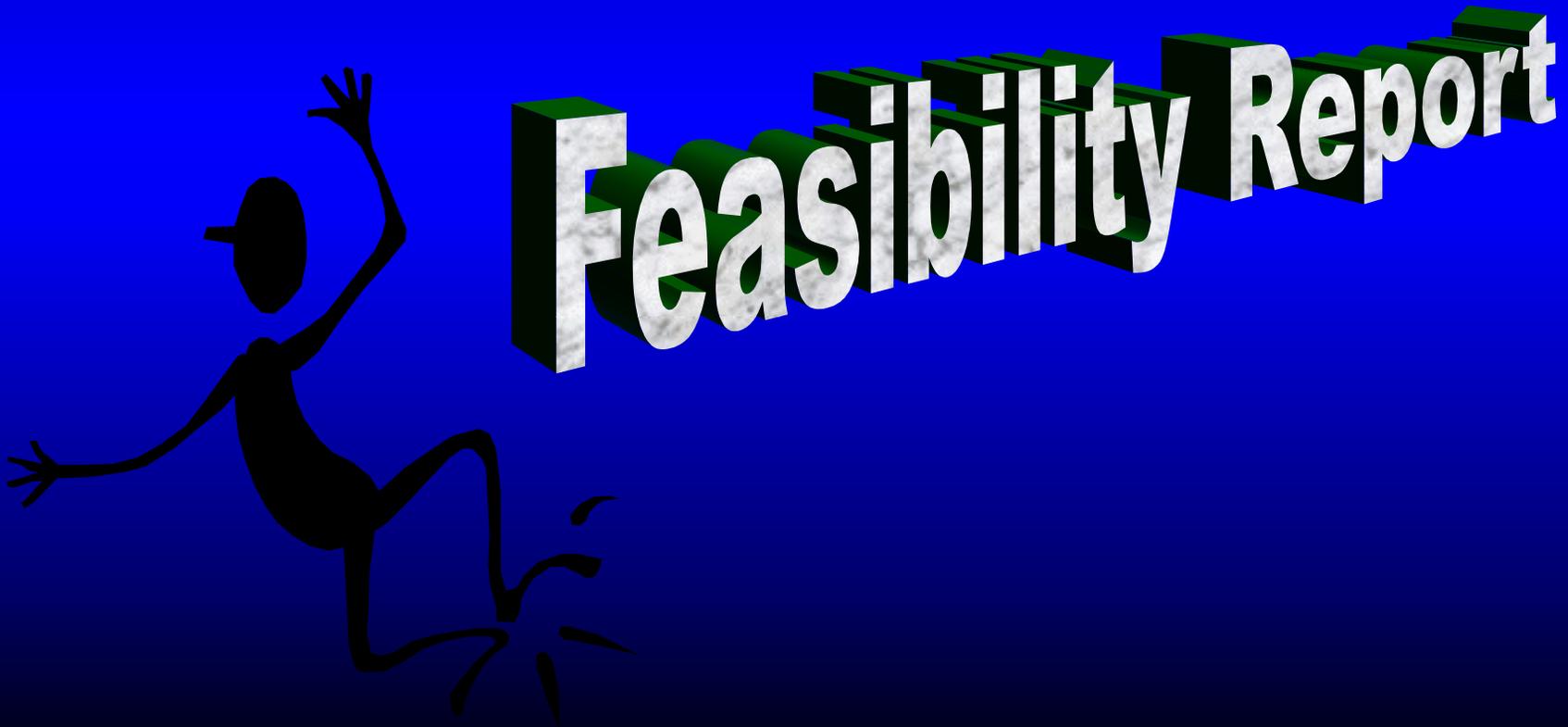
- ◆ Local sponsor must be identified to cost share the project design and construction
- ◆ Sponsor must provide a letter intent (LOI) stating their willingness to cost share
- ◆ Preliminary Financial Analysis



# Feasibility Report:

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- ◆ All the work performed during this phase of the study is documented in a



# Project Management Plan:

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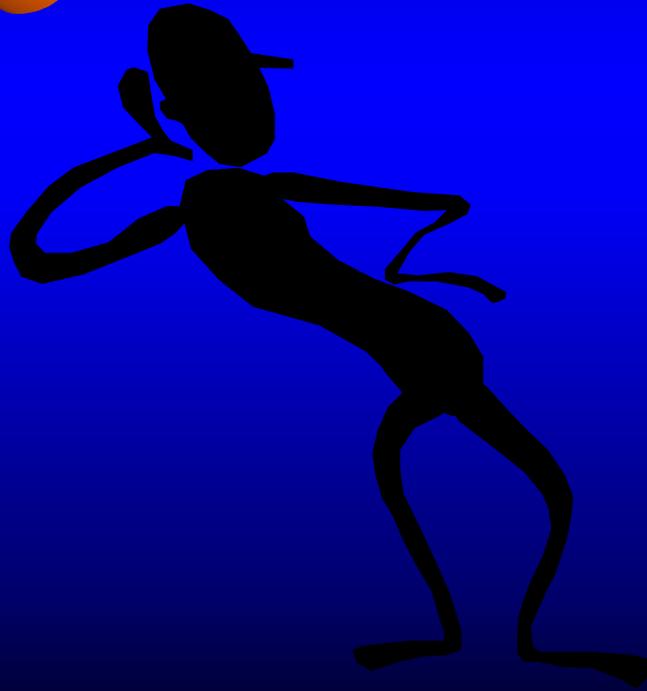
- ◆ Project Manager expands the Project Management Plan (PMP) to cover implementation of the recommended plan
- ◆ Lays out the activities, schedule, and funding through PED and construction phases

# SUMMARY

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- ◆ Cost shared 50/50 with a non-Federal sponsor(s)
- ◆ 6 steps in the planning process
- ◆ Determine “best” plan:
  - ▼ Economically justified
  - ▼ Environmentally sound
  - ▼ Engineeringly feasible
  - ▼ Socially/Politically acceptable
- ◆ Feasibility Report = Decision and Project Authorization Document

# Questions P P



# Objective:

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This part of the module will discuss the following

- ◆ Importance of interdisciplinary team
- ◆ Composition of interdisciplinary team



# Interdisciplinary Teams

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- ◆ **Two heads are better than one**
- ◆ **Teams can better address complex issues**
- ◆ **No one person, no one discipline, no one group has all the answers**
- ◆ **High performing teams are efficient**

**OCCASIONAL  
TEAM Member**

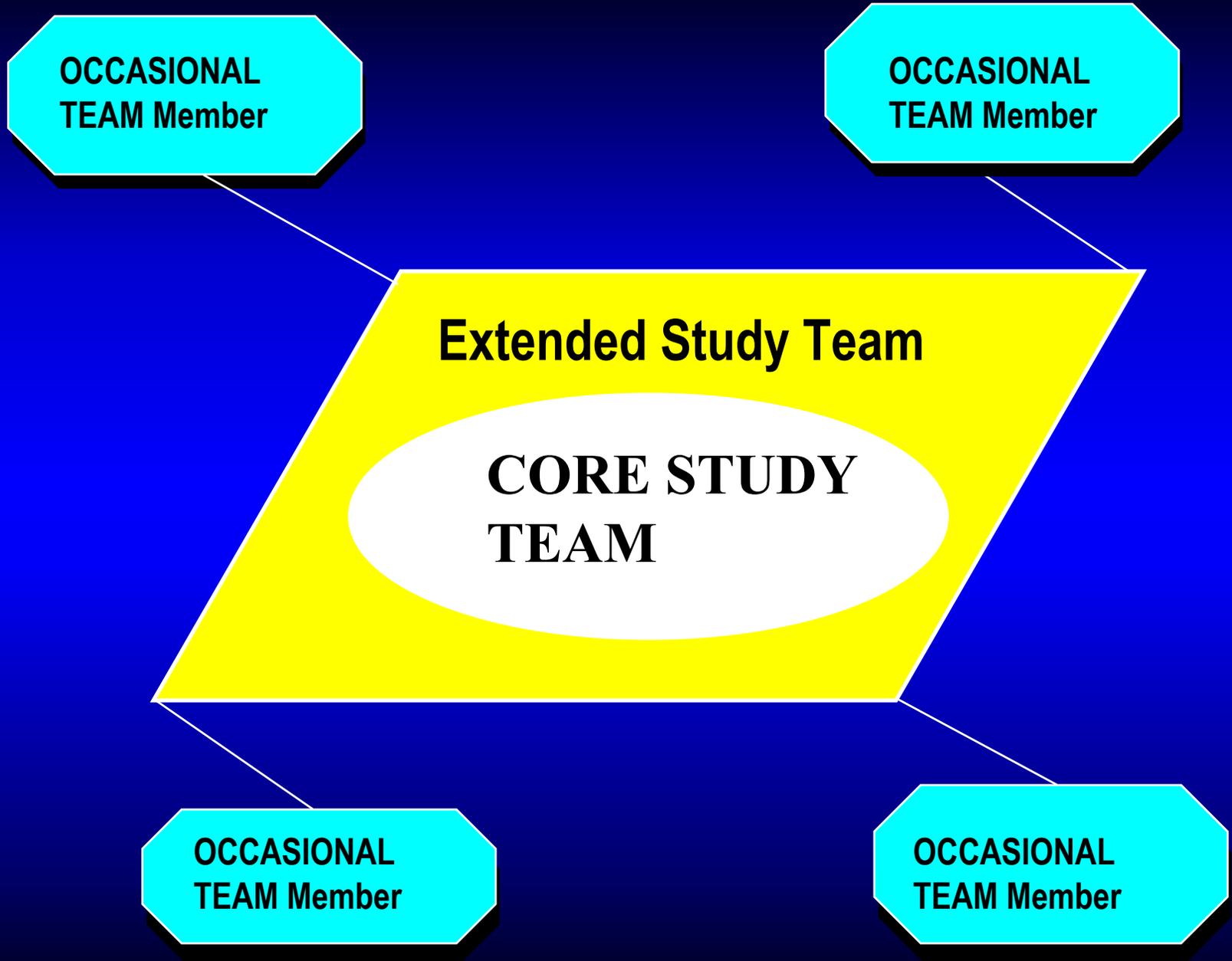
**OCCASIONAL  
TEAM Member**

**Extended Study Team**

**CORE STUDY  
TEAM**

**OCCASIONAL  
TEAM Member**

**OCCASIONAL  
TEAM Member**



# Interdisciplinary Team

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- **Corps of Engineers Members**
- **Non - Federal Sponsor**
- **Resource Agencies**
- **Other Stakeholders**

# Corps Interdisciplinary Team

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- **Technical Team Leader**
- **Project Manager**
- **Corps Experts**
  - Economist
  - Environmental Specialist
  - Cost Engineer
  - Real Estate Specialist
  - Project Engineer
  - Other Professional Disciplines

# Corps Interdisciplinary Team

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- **Other Corps Team Members**
  - Operation Person
  - Construction Person
  - Value Engineer
  - Regulatory Specialist
  - Office of Counsel
  - Contracting Specialist
  - Cultural Resources

# Technical Team Leader

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- **Orchestrate the study process**
- **Coordinate internal and external activities**
- **Guide the formulation of plans**
- **Guides report preparation**
- **Conduct public Involvement**

# Project Manager

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- **Focus on the overall project development process**
- **POC for Congressional Interest**
- **Principal POC for Sponsors**
- **Responsible for study budgeting and scheduling**
- **Manage project resources, data, and commitments**

# Economist

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- Document trends, economic conditions and demographics of the study area
- Develop with and without project conditions to estimate potential benefits
- NED Evaluation
- Incremental analysis for restoration projects
- Assessment of Financial Analysis
- Assessment of Ecosystem Benefits

# Environmental Specialist

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- **Collect environmental data**
- **Conduct environmental assessment**
- **Implement actions to meet NEPA and all other environmental protection statutes**
- **Coordinate with other resource agencies**
- **Conduct cultural resource evaluation**

# Real Estate

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- Appraisals
- Rights of Entry
- Determines types of estates required for project
- Helps develop terms of local cooperation

NEED TO INVOLVE THIS MEMBER EARLY AND  
THROUGHOUT THE STUDY PROCESS

# Engineering

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- **Cost Engineer**
  - Preliminary cost estimates of alternative plans
  - M-CACES cost estimate of recommended plan
- **Geotechnical Engineer**
  - Soil Analysis
- **Hydrologist**
  - Conduct model studies of alternative design

# Engineering

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- **Design Engineer**
  - Structural design
  - Drawings/plates
- **Value Engineer**
  - Review project for efficiencies in materials, design and construction

# Resource Agencies

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- **US Fish and Wildlife Service**
- **US Environmental Protection Agency**
- **State Department of Environment**
- **State Department of Natural Resources**
- **National Marine Fisheries Service**
- **State Fish and Game**
- **Office of Historic Preservation**

# Stakeholders

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- **Environmental Groups**
- **Community Groups**
- **River Basin Commissions**
- **Special State Established Districts**
- **Citizen Groups**
- **Native American Tribes**
- **Developers**

# Questions P P

