ZOAR LEVEE & DIVERSION DAM
Muskingum River Basin, Tuscarawas River, OH

DAM SAFETY MODIFICATION STUDY PROCESS PRESENTATION TO THE VILLAGE OF ZOAR STEERING COMMITTEE

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Huntington District
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PURPOSE

BRIEFING:

► Corps Dam Safety Program

► Planning Course of Action

► Report Review & Approval Process
As a result of 2008 storm event Zoar Levee and Diversion Dam is a DSAC I (Urgent and Compelling)

- Progression toward failure is confirmed to be taking place under normal operations and the structure is almost certain to fail under normal operations within a time frame from immediately to within a few years w/o intervention; or, the combination of life or economic consequences with probability of failure is extremely high.
DSAC 1

IRRMs Plan

Implement IRRMs

Conduct DSM Study

Recommend Risk Management Plan

Approve Implement
INTERIM RISK REDUCTION MEASURES

► Installed additional piezometers
► Rehab existing relief wells & added relief wells
► Properly abandoned old relief wells
► Constructed toe drain and interior collection system
► Stockpile of materials for future events
► Interim Surveillance Plan
► Adding the 3rd pump and new emergency generator for pump station, which it was originally designed to have
WHAT IS A DAM SAFETY MODIFICATION (DSM) STUDY

- **Purpose**: To justify modifying USACE project to address risks associated with Dam Safety to meet USACE tolerable guidelines
- **Why**: A DSM study is required for all structural and non-structural project modifications to address dam safety
- **Goal**: Find the best risk management plan
<table>
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<th>Steps</th>
<th>1105-2-100 USACE Planning Selection Process</th>
<th>1110-2-1165 USACE DSM Selection Process</th>
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<td>Id Problems &amp; Opportunities</td>
<td>Id Dam Safety Issues &amp; Opportunities</td>
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<td>Planning Objectives &amp; Constraints</td>
<td>Safety Objectives &amp; Constraints</td>
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<td>Formulating Risk Management Plans</td>
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<td>Management Measures</td>
<td>Risk Reduction Measures that meet</td>
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<td>That meet P&amp;G Measures</td>
<td>P&amp;G Measures + PFMA / Life Safety Tolerable Risk / ALARP</td>
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<tr>
<td></td>
<td>Completeness/Efficiency/Effectiveness/Acceptability</td>
<td>No Action / USACE Guidelines / Removing Structure -Consideration of Non-Structural Required</td>
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<td>No Action Required/Consideration of Non-Structural/Required</td>
<td>Protection to Nation’s Environment</td>
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<td>4.</td>
<td>Evaluate Alternative Plans</td>
<td>Evaluate Alternative Risk Management Plans (RMPs)</td>
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<td>Forecast w/ project for each alternative</td>
<td>Forecast future with each RMP</td>
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<td>Compare each against w/o project</td>
<td>Compare each RMP to baseline risk condition</td>
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<td>Compare against P&amp;G accounts: *NED / *EQ / RED / OSE</td>
<td>Characterize beneficial and adverse effects</td>
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<td>Compare Alternative Plans</td>
<td>Compare Alternative RMPs</td>
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<td>Compare between alternatives</td>
<td>Compare between plans</td>
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<td>Outputs &amp; effects / beneficial &amp; adverse effects</td>
<td>Outputs &amp; effects / beneficial &amp; adverse effects geared towards Annual Probability of Failure / Life Safety Tolerable Risk / ALARP / USACE Guidelines</td>
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<td>Monetary &amp; Non-Monetary Benefits &amp; Costs</td>
<td>Must Carry Forward No Permanent Risk Reduction Action Plan</td>
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<td>Must Carry Forward &amp; Compare to No Action /</td>
<td>Rank Plans</td>
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<td>Rank Plans</td>
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<td>6.</td>
<td>Select a Plan</td>
<td>Select a Risk Management Plan</td>
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<td>National Economic Development (NED)</td>
<td>Based on Ranking in Step 5.</td>
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<td>Must Be Identified</td>
<td>Must be beneficial over No Action Plan</td>
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<td>NED is the plan that reasonably maximized net economic benefits</td>
<td>Economic &amp; Environmental Consideration</td>
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<td>consistent with protecting the Nation’s environment</td>
<td>Update Risk Assessment after remedial risk reduction measures to determine if risk objectives were achieved</td>
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**Iteration Often Necessary Steps 1-5**
6 Step Dam Safety Modification Study Process

1. Identify what’s wrong with Zoar Levee and Diversion Dam and look for opportunities to remove the public from harm;

2. Study the current problems with Zoar Levee and Diversion Dam to look for and document what could be harmed if the problems continues unchecked;

3. Develop a wide collection of potential solutions that address the problems associated with the project;

4. Evaluate the completeness, efficiency, effectiveness, and acceptability of each individual potential solution;

5. Compare the potential solutions against each other to rank them;

6. Identify the recommended plan.
STEP 1
Determine the Scope of this Study

• What is wrong with Zoar Levee and Diversion Dam?

• What opportunities exist to reduce risk to life and property?
  • How can we keep people out of harm’s way?
  • Public Safety is our Number 1 Concern.

• What are the study objectives?

• What are the study constraints?

• Notice of Intent

• Public Scoping Meeting
STEP 2
Defining the Problems & Potential Consequences

• What are the potential ways that the Levee or Diversion Dam could fail?

• What’s the chance it will fail in a given year?

• What will be harmed if a given failure occurs?

• What happens if we do nothing?
STEP 3
Identifying Potential Solutions

Data and stakeholder input gathered in Steps 1 & 2 will be used to identify potential measures that can be combined into alternative solutions.

• Solutions must:
  • be in compliance with all statutes, regulations and common law
  • address all potential problems (failure modes) identified, as well as meet study opportunities
  • address study objectives, with consideration of constraints
  • not be limited to solutions that only the Corps can implement
STEP 4
Evaluating Potential Solutions

Each alternative plan should be independently evaluated as to its:

- Completeness: does the alternative meet the study objectives?
- Efficiency: is the alternative the most cost effective means of achieving the objective?
- Effectiveness: the degree to which the alternatives meets the study objectives.
- Acceptability: is the alternative acceptable in terms of applicable laws, regulations and public policies.
STEP 5
Comparing Potential Solutions

The goal of this step is to rank the potential solutions in terms of the Four Criteria;

• Completeness,
  • Efficiency,
  • Effectiveness,
  • Acceptability.

The potential solutions are compared:
• to the No Action alternative; and

• with each other to determine the difference in the benefits and adverse effects between the alternatives
STEP 6
Identify the Recommended Solution

At this time the Draft Dam Safety Modification Study Report will be provided to all stakeholders for review and comment.

Notice of Availability and Public Hearing

All comments received will be addressed and/or incorporated into report.
SELECTION CONSIDERATIONS FOR ZOAR LEVEE AND DIVERSION DAM DSM STUDY

- DSM Selection Criteria
  - Tolerable Risk Plan

- Principles and Guidelines
  - National Economic Development (NED) Plan

- Other Federal Planning Laws Criteria
  - National Environmental Policy Act
  - National Historic Preservation Act
Primary Evaluation Factors

- Life Safety is Paramount
- Annual Probability of Failure
  - PFMA must be addressed by selected alternative
- Tolerable Risk Guidelines
  - ALARP (as-low-as-reasonably-practicable considerations)
- USACE Engineering Guidelines
- Social
- Environmental
- Economic
PRINCIPLE & GUIDELINES FOR WATER RESOURCES PLANNING

FOUR ACCOUNTS

- National Economic Development (NED)
  - Identification of the NED plan - plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment.
    - Identification of the NED plan is required

- Environmental Quality
  - Non-monetary effects on cultural, aesthetic ecological resources

- Regional Economic Development (RED)
  - Regional economic activity (employment /income)

- Other Social Effects (OSE)
  - Community Impacts, health & safety, displacement
NATIONAL ENvironmentAL policy act (NEPA)

- No action
  - Must be in final array

- All reasonable alternatives

- Consider impacts to:
  - Social environment
  - Cultural environment
  - Natural environment

- Try to avoid, minimize, or mitigate impacts
THE VILLAGE OF ZOAR IS LISTED IN THE NATIONAL REGISTER OF HISTORIC PLACES

Archeology (Known & Unknown)
Levee and Dam are NRHP Eligible
Dam Safety Modification Study Review & Approval Process

I. Vertical Team Involvement & Reviews
   a) Team Make-UP
      i. Dam Safety Officers (District / MSC / HQ) & Risk Management Center (RMC)
      ii. Planning & Policy (District / MSC/ HQ)
   b) Milestones
      i. Kick-off Meeting
      ii. Feasibility/Alternative Scoping Meeting
      iii. Alternative Formulation Briefing

II. Agency Technical Review (ATR)
    a) Panel of Corps Experts outside of District Reviews Study

III. Independent External Peer Review (IEPR)
     a) Panel of Non-Corps experts reviews study

IV. Approval Process
    a) ATR Certifies
    b) District DSO / IEPR Joint Approval
    c) QA and Policy Compliance Review (MSC)
    d) HQ Review
       i. RMC& SOG Chairman / Special Assistant DS
       ii. Office of Water Project Review
    e) Approval
       i. Signed by USACE DSO (Chief of Engineering & Construction)
       ii. EIS ROD Typically Signed by Director of Civil Works