Pennsylvania's Second Annual Watershed Conference on Abandoned Mine Reclamation

June 16 and 17, 2000
Penn Stater Hotel and Conference Center
State College, Pennsylvania

Sponsored by:

Western Pennsylvania Watershed Protection Program
Eastern Pennsylvania Coalition for Abandoned Mine Reclamation
Western Pennsylvania Coalition for Abandoned Mine Reclamation
Canaan Valley Institute
Pennsylvania Trout Unlimited
Pennsylvania Department of Conservation and Natural Resources
Pennsylvania Department of Environmental Protection
U.S. Office of Surface Mining

Conference Coordinator: Pennsylvania Environmental Council

TO: ALL PARTICIPANTS OF THE SECOND ANNUAL STATEWIDE CONFERENCE ON ABANDONED MINELANDS

FROM: CONFERENCE PLANNING TEAM

ENCLOSED PLEASE FIND:

- THE PRINTED PRESENTATION MATERIALS FROM THE RESPECTIVE SPEAKERS AT THE CONFERENCE; AND,
- A BRIEF SYNOPSIS OF THE PRESENTATIONS MADE BY THE SPEAKERS THAT DID NOT USE OR PASS OUT PRINTED MATERIALS.

WE HOPE THAT YOU ENJOYED THE CONFERENCE AND WE HOPE THAT THIS MATERIAL CAN BE OF USE IN YOUR CONTINUING WORK TOWARD IMPROVING THE QUALITY OF PENNSYLVANIA'S ENVIRONMENT.

SESSION 1: PROBLEM IDENTIFICATION AND ASSESSMENT

Janie French

- Market problem identification and assessment to get funding and to get attention of elected officials.
- Based on discussion at recent USEPA Roundtable: Relate problems to cost to community (economic overview) and to human health issues and highlight these issues.
- Citizen Volunteer Monitoring Workshop: now doing bacteria testing so that they can look at health issues. This is a natural fit with AMD assessments.
- We need to focus on issue that AMD impacts our quality of life.
- AML trust fund up for reauthorization in 2004. We need to work together to get reauthorization. As we do assessments and marketing of watersheds, we, as citizens, need to understand how federal issues affect our watershed.
- NRCS is an important partner in PA(NRCS doesn't work as closely with groups in other parts of the country).
- Federal Policy issues are coming to a head. Federal partners should be more active at the state level.

Robert Hughes-Please refer to Session I Handout

Mark Killar

- Showed how a relatively young group set up a monitoring program:
- Shoup Run Watershed Association- Bedford and Huntington counties. The association was relatively new and didn't have much information about the watershed.
- Association needed to do an assessment:
    - Looked at tributaries to Shoup Run.
    - Picked monitoring point at mouth of every tributary coming into Shoup's Run (to get good mix and to see comparative effect).
    - Used simple lettering/numbering system. Start at mouth as point #1 and work upstream. Use first 2 letters of each tributary as identification (e.g. SR-1-Shoup's Run 1, SR-2, SCR-1-Sugar Camp Run1, SCR-2).
    - Sometimes took additional monitoring further up the larger tributaries (Use topo maps and identify points, e.g. below a former strip mine, to determine locations.
    - Need to pick easily accessible points with good data gathering potential.
    - Eventually, you'll be able to identify the specific discharge points. Base your design on this information.
    - Can use biological assessment in addition to chemistry assessments.
    - Best way to find discharges; walk the stream (best time: fall or spring, when there is no vegetation)
    - Want to make sure you find the actual source/discharge point to be accurate (may require you to investigate further…may be a combined inflow or other contributing sources).
    - The point of doing such extensive investigation is to determine where your priorities are for the design of your system.

Weirs (Mark had slides showing designs of Weirs):

- Need to collect flow and chemistry information at points where you build weirs(must measure water flow correctly).
- Weir height/cut out: you want a "waterfall" effectively backing up water.
- Place gauge 2 x height of weir to crest behind weir.
- Will get mistakes (up to 20%) if you gauge right at the weir crest because of drawdown.
- Must actively maintain weirs (can get clogged)

Parameters checked for when sampling: ph
Acidity
Alkalinity
Total iron
Ferris iron
Aluminum
Magnesium
Sulfates
Dissolved oxygen

- Design weirs to measure high or low flows. "V" notch good for low flows. "Rectangular" wiers are good for larger flows.

POWR. Taking over coordination of Citizens Monitoring Program Group, and, as this takes place, they will coordinate sampling tools, such as plans and techniques and methodology.

In assessment you must complete study design and monitoring plan. Quality control is very important: you need good and consistent data.

Also, you need to ensure that, if you have multiple people monitoring, you get consistency, in data collection, such as location, etc.

- Can use pipes, buckets, and a stopwatch to measure flow.
- Can use and develop written protocol.
- Can utilize GPS unit and laptop in conjunction with USGS software to account for accurate positioning.

SESSION 2: HOW TO FIX WHAT'S WRONG

Bob Hedin-Please refer to Session II Handout

Dan Koury -Reviewed several projects in Swatara Creek Watershed

- Cited PCA mining statistics pre and post 1977
- Coal veins: anywhere from 0'-100'
- Very complex geology
- Very large spoil piles left over from old practices
- Can do macrobiotic or fish surveys to determine impact
- Flow data is very critical
- Use of diversion wells-water power itself is utilized to break up limestone
- The science of AMD is still imperfect-experimentation can be good
- Possible use of upgradiant ponds to regulate flows (prevent extreme of some peak flows).
  Excess space requirements may make it unfeasible

SESSION 3: FROM DESIGN TO CONSTRUCTION

Please refer to Session III Handout

SESSION 4: ONGOING STEWARDSHIP OF YOUR PROJECT AND ORGANIZATION

Peter Dalby- Please refer to Session IV Handout

Bernie McGurl
"Depression is just anger without the enthusiasm"
"Eagles may soar, but weasels and muskrats don't get sucked into airplane engines"

- Need to be a steward of your organization
- Having a good CPAs/firm(s) is critical
- Need for organizational cash reserve
- Two vital agencies: Fed IRS- letter of determination of nonprofit, charitable, tax exempt status.
  PA Dept. of State Bureau of Charitable Organizations.
- 501(C)(3)-Good for most watershed groups, public purpose, education, advocacy, conservation work(tax exempt)
- 501(C)(4)- good status for lobbying/litigation/politician action(Not tax exempt)
- Need to maintain organizational continuity
- There will be eventual turnover in staff, board, etc.
- Must maintain leadership obligation within you organization to meet:
  *Business and financial management of organization.
  *Goals/mission of the organization.
- Encourage the advancement and empowerment of staff and board and don't close off leadership- keep it open/social.
- Recognize the value of your volunteers – give them certificates of achievement
- Working with local officials

-It is the job of watershed groups to educate them and learn from them.
-Two words: patience and persistence
-Much easier after you have that first success

SESSION I
PROBLEM IDENTIFICATION AND ASSESSMENT

Problem Identification and Assessment:

Taking A Good Look at Your Watershed and Identifying Problem Areas

Watershed Profile & Description

- Basic Map of the Watershed (the streams, tributaries, reservoirs, ponds, lakes, etc.)
- Major Topographic Features (mountains, ridges and valleys, gaps, wetlands, etc.)
- Geo-Political Boundaries (townships, boroughs, cities, towns, villages, glens, etc.)
- Brief description of the following elements
  - Historical and Archeological significance
  - Geological, Biological, and Chemical elements

Problem Identification

- To proceed towards restoration & remediation within the watershed define:
  - Problems, Threats, Potential Impacts
  - Opportunities for improvement
- Problems and Opportunities should be defined in broad terms
  - Overall Condition of the Watershed
  - Watershed Snapshot
  - State of the Watershed
  - Indicators of Watershed Health

Problem Identification

- Should include:
  - All environmental problems associated within a watershed
  - AMD, Coal silt sedimentation, Sewage, Runoff, Acid Rain, Point & Non-Point Sources (NPS)—Water Quality Assessment; Flow data is integral
  - Land Use Development, Land Use Practices, & Land Use Patterns
  - PA Natural Diversity Indices (PANDIs)
  - Geologic Formations within the watershed--USGS

Sources of Information About the Quality of a Watershed

- Most important and foremost are the LOCAL PEOPLE who live in the watershed
  - Generations of families (Oral Histories)
  - Professionals within the community

- Public Participation is Essential to the development of an effective and usable watershed assessment
  - Hold a series of public meetings to gather input throughout the watershed area to promote interest in the assessment and to collect information

In Addition to the Local People

- Published Reports, Maps, Studies, Surveys
  - DEP, USGS, ACE, Scarlift Studies
  - PA Fish & Boat Commission Studies
  - Colleges & University Studies
  - Local Watershed Associations
  - Industrial Plant Studies
  - DCNR Rivers Conservation Plans
  - Private Consulting Firms
  - River Basin Commissions (SRBC, DRBC, etc.)
  - 303 (d) List of Impaired Waters
  - 305 (b) Report

Public Participation

- Studies will help to serve a good "scientific" base for a broad watershed assessment
- However, perceptions and local participation are equally as important; try for consensus
- Be all inclusive and bring everyone out to help define the watershed assessment
  - Listen to see and hear what local priorities and concerns surface at the public meetings
  - Design questionnaires to solicit information

Common Problems & Concerns Identified by Locals

- Generally, environmental problems in a watershed are tied to land use practices which have an impact on water quality
  - Water quality deterioration, Decreased Stream Flow
  - Water supply contamination or diminution
  - Aesthetics, Quality of Life
  - Degraded Aquatic and Wildlife Habitat, Loss of Wetlands
  - Impact upon a need; e.g. recreation, site specific concern
  - Economic Impact—Development Opportunity Lost

Common Problems & Concerns Identified by Locals

- Cont'd
  - Flooding, Floodplain Management, Sediment Deposition
  - Land Use Issues—Zoning, Redevelopment of abandoned mine lands and brownfields
  - Untreated wastewater, combine sewer overflow (CSO), & stormwater runoff
  - Threats to public health and safety
  - Agricultural runoff, pesticides, nitrates, etc.
  - AMD, Stream Loss into the abandoned mines

Vision for the Watershed

- Set Broad Expectations, Limitations, and Capabilities on all of the stakeholders
- Expectations should evolve from:
  - The public
  - Landowners within the watershed
  - Local, County, State, Federal Government
  - Environmental and Watershed Organizations
  - Community & Civic Groups
  - Business and Industries in the Watershed

A Case Study: The Upper Schuylkill Headwaters Tributaries Watershed Assessment, Schuylkill County

- Sponsoring Organizations (319 Incremental Grant)
  - **Schuylkill Headwaters Association**
  - **Schuylkill RiverKeeper**
  - **Schuylkill County Conservation District**
  - **Eastern PA Coalition for Abandoned Mine Reclamation (EPCAMR)**
- Contracted firm (with proven experience in AMD)
  - **L. Robert Kimball & Associates**

Watershed Restoration Action Strategy (WRAS) to be Completed on the Upper Schuylkill Headwaters

- The WRAS will include:
  - Identification and assessment of NPS, mostly consistent of AMD impacts and raw sewage inputs into the streams
  - Prioritization and Comprehensive inventory/database of AMD discharges
  - General recommendations, cost estimates, for future remediation and mitigation strategies for particular discharges
  - Provide overall guidance and direction in the management of the Upper Schuylkill River Tributaries

Superb Local Leadership Shines on the Schuylkill!!

- The local sponsors and LRK working on the Upper Schuylkill River Watershed Assessment inevitably by the end of this summer will provide:
  - A solid base of local information, water quality data, a GIS Inventory, for the 127 sq. mile watershed to the public at large
  - A starting point for the rational allocation of manpower, money, and other valuable time & energy

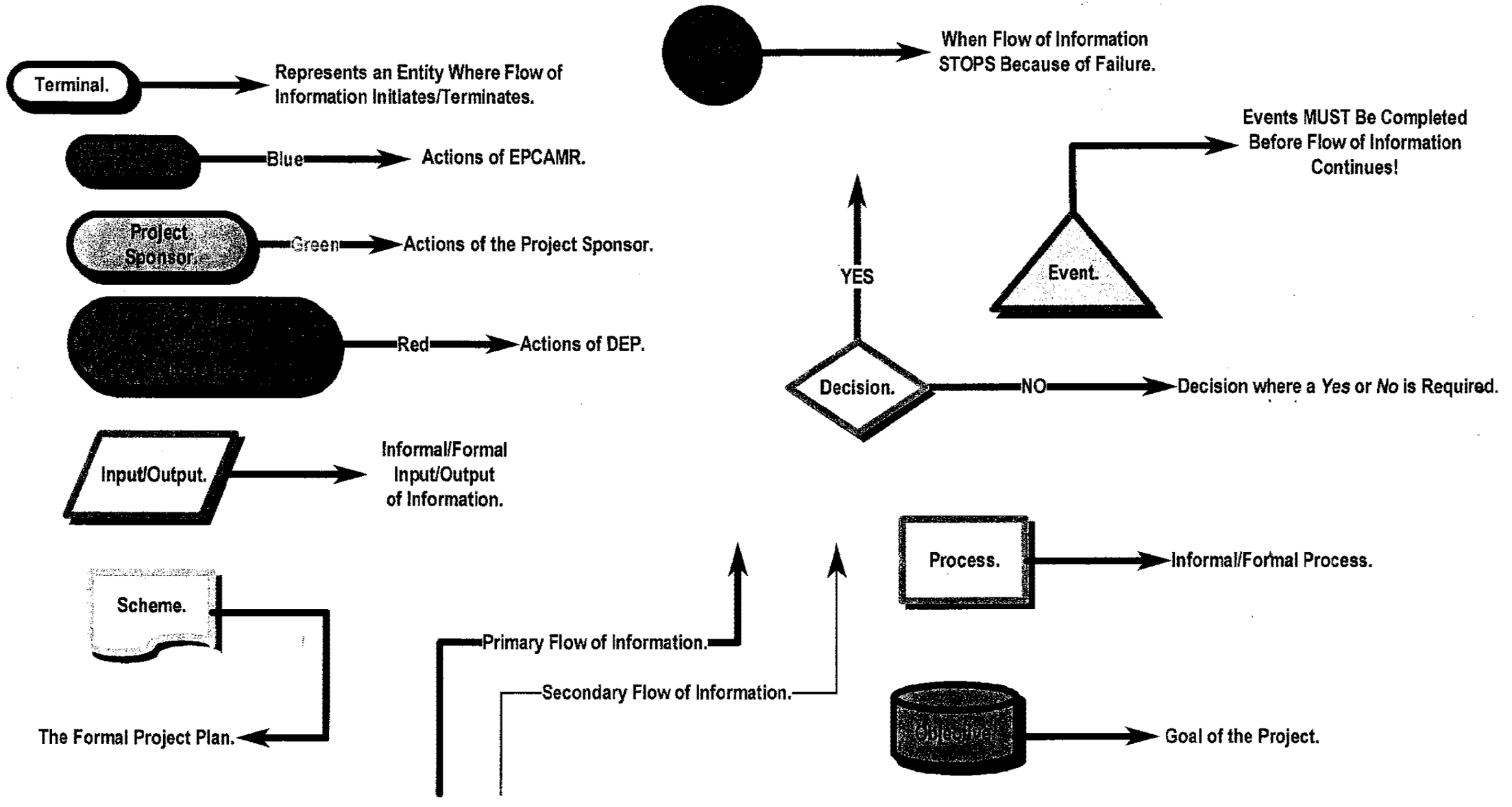
Upper Schuylkill Tributaries Watershed Assessment Work Products

- A description of the extent & environmental impacts of AMD and other NPS impacts on the Upper Schuylkill Tributaries
- A detailed list and watershed map of AMD surface outfall locations along the tributaries
- A WRAS (Final Assessment Report) for the entire Upper Schuylkill Headwaters Tributaries
  - **A detailed list of proposed treatments**
  - **A prioritized list of future remediation projects**
  - **Preliminary design standards and estimated costs for high priority projects**
  - **Photo survey of the AMD discharges**
  - **GIS CD of all data layers and databases related to the project**

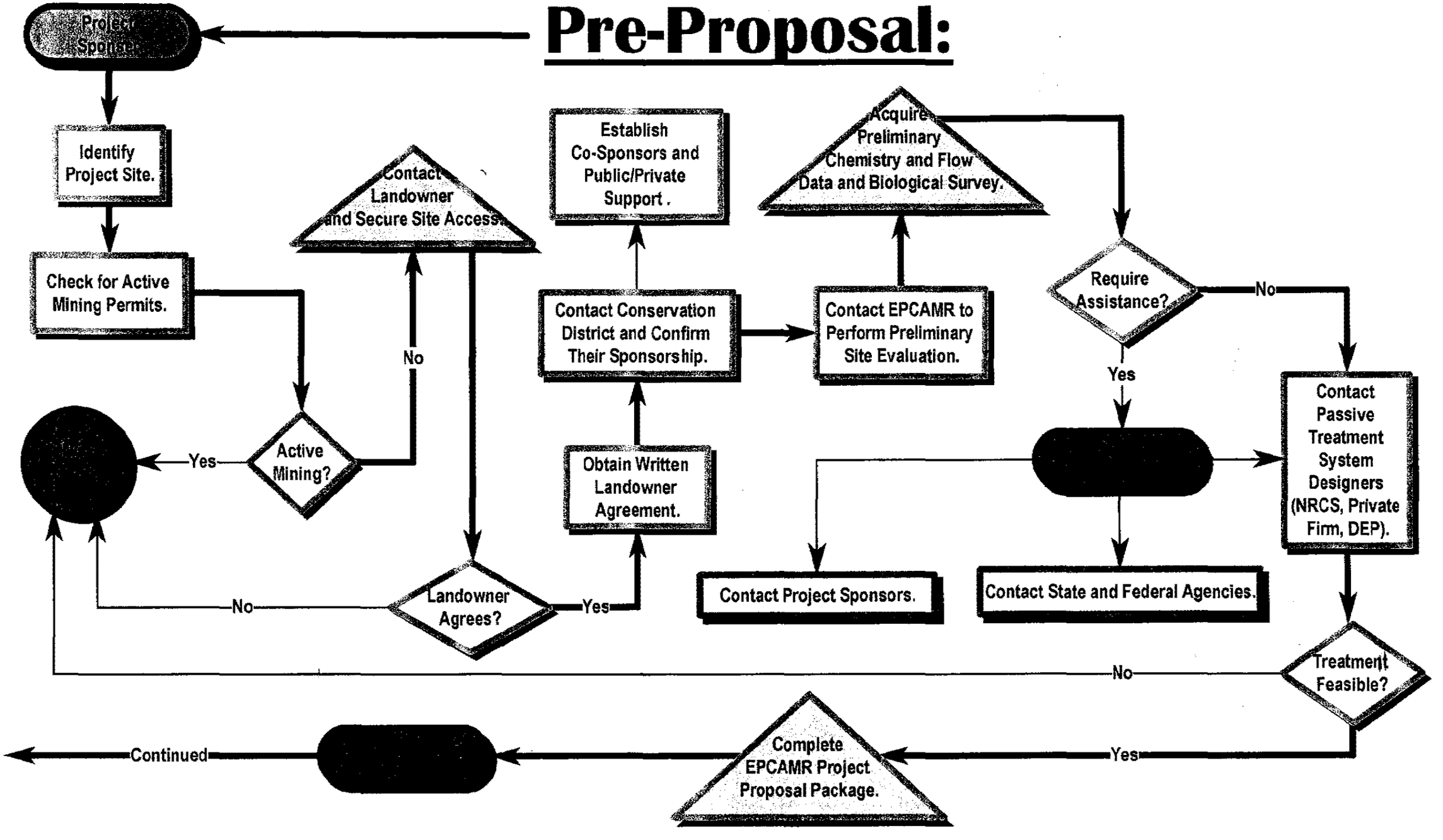
EPCAMR
AMD Remediation Project Planning Flowchart

Prepared by:
Robert Hughes, EPCAMR Regional Coordinator
Mark Killar, WPCAMR Regional Coordinator

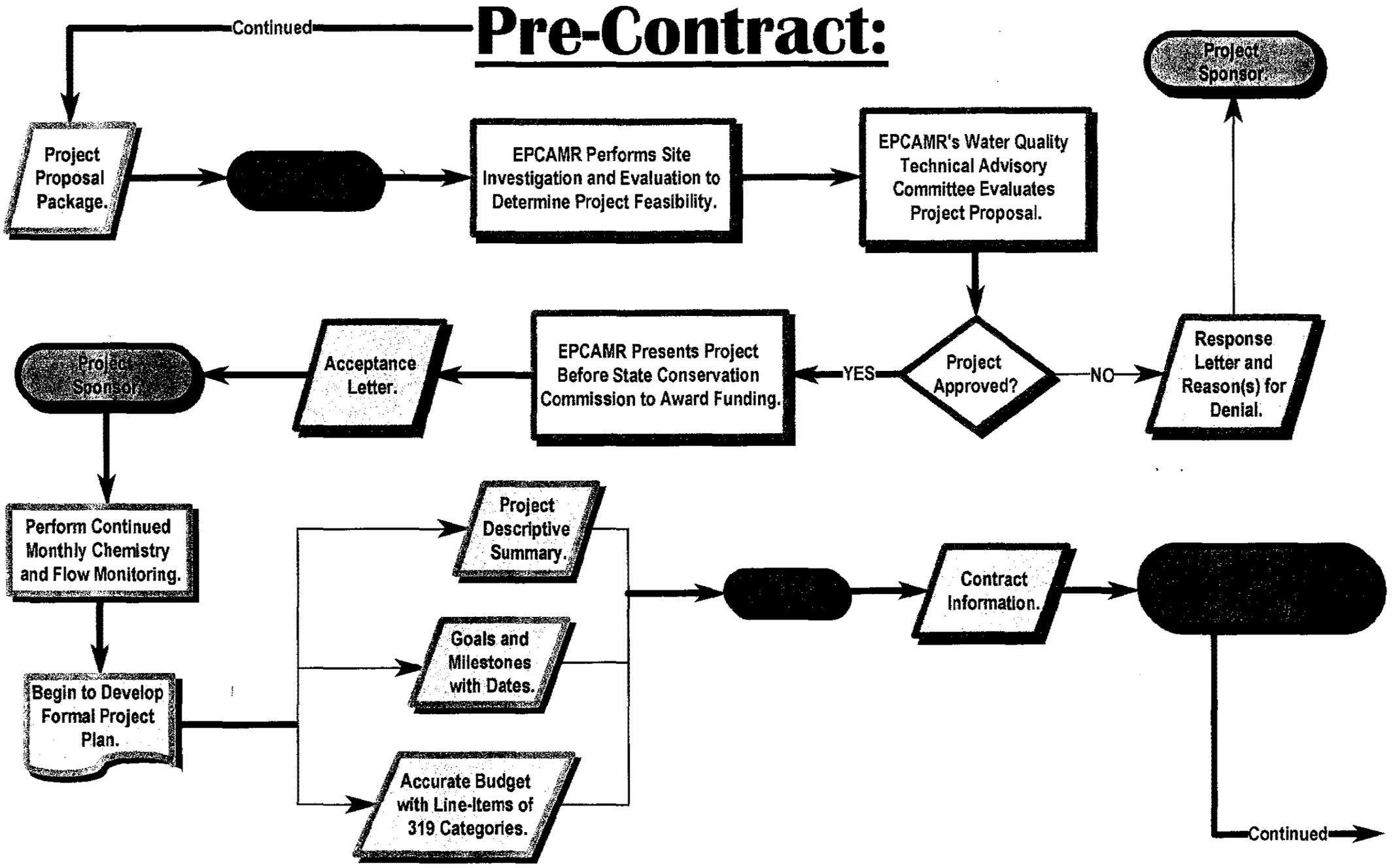
Flowchart Legend:



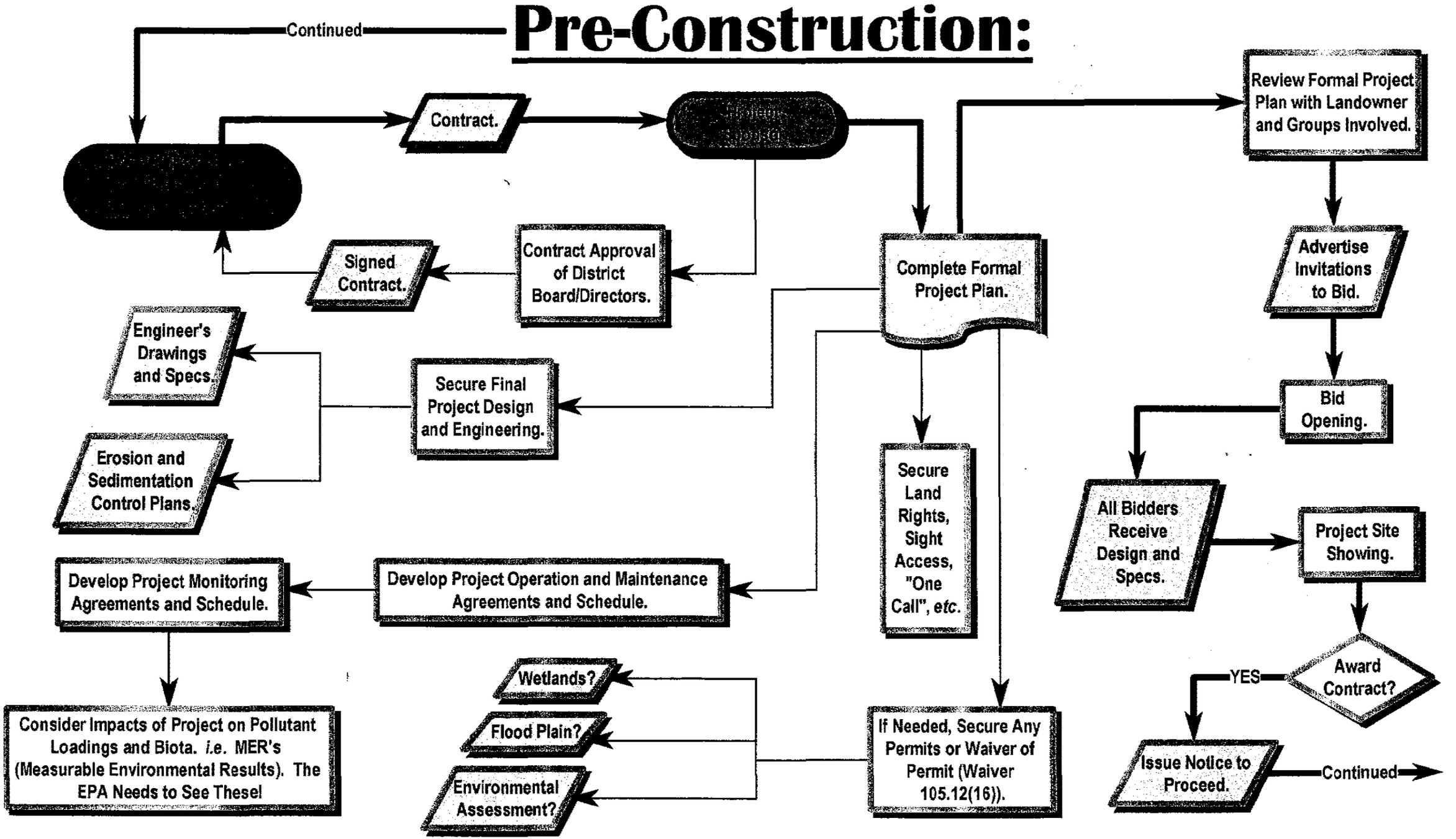
Pre-Proposal:



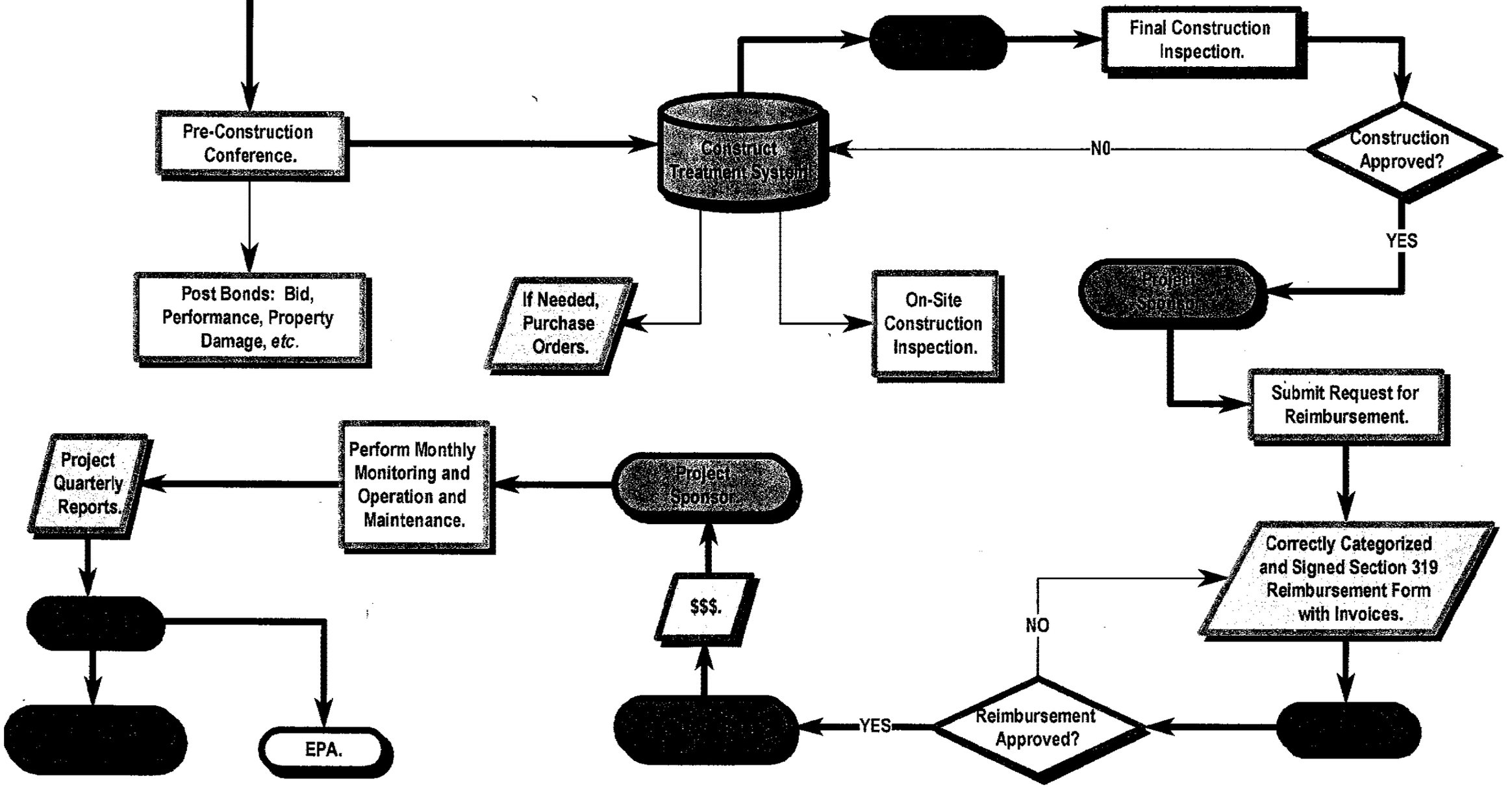
Pre-Contract:



Pre-Construction:



Post-Construction:



SESSION II
HOW TO FIX WHAT'S WRONG

AMD: Formation, Characterization, Remediation

Bob Hedin
Hedin Environmental
Mt. Lebanon, PA

The Problem

- >2000 miles of streams polluted in PA
- >5000 miles in eastern US
- Largest water pollution problem in Appalachian region
- Devastating ecological effects
- Limit public and industrial uses of water

The Opportunity

- Recent changes in environmental regulations and mining practices have stopped the creation of new sources of pollution
- Technologies have been developed that make stream restoration feasible
- Increased interest in local environmental problems
- Increased funding from federal and state programs

The Challenge

- Stream remediation is interdisciplinary activity – makes projects very complex
- Problems that took decades to create cannot usually be corrected quickly
- Streams cross political boundaries
- Remediation technologies are still being developed – few cookbook situations

Issues considered in AMD Projects

- Mining History
- Geology
- Hydrology
- Chemistry
- Biology (micro, macro and ecology)
- Engineering

Mine Drainage (MD) Chemistry

- Important reactions
  - Pyrite Oxidation → dissolved Fe & acidity
    - $FeS_2 + O_2 + H_2O \rightarrow Fe^{2+} + SO_4^{2-} + H^+$
  - Fe precipitation → particulate Fe & acidity
    - $Fe^{2+} + O_2 + H_2O \rightarrow Fe(OH)_3 + H^+$
  - Clay dissolution → dissolved Al
    - $Clay\text{-}Al + H^+ \rightarrow Clay\text{-}H + Al^{3+}$
  - Calcite Dissolution →dissolved Ca & alkalinity
    - $CaCO_3 + H^+ \rightarrow Ca^{2+} + HCO_3^-$
  - Bacterial sulfate reduction → H_2S & alkalinity
    - $CH_2O + SO_4^{2-} + bacteria \rightarrow H_2S + HCO_3^-$

The mixture of acidic and alkaline reactions matters

- No pyrite oxidation and limited carbonate dissolution = HQ poorly buffered waters
- No pyrite oxidation and carbonate dissolution = HQ well buffered waters
- Pyrite oxidation and limited carbonate dissolution = Acidic water with metals
- Pyrite oxidation and carbonate dissolution = Alkaline water with metals

Types of Mine Water Chemistry

- **net alkaline, Fe contaminated**
- **net alkaline Fe and Mn contaminated**
- **net acidic Fe^{2+} and Mn contaminated**
- **acidic Fe, Mn, and Al contaminated**

What is the "A" in AMD?

- *acid* mine drainage
- *alkaline* mine drainage
- *abandoned* mine drainage
- *Anglo* mine drainage
- *Asian* mine drainage

Goals of Mine Drainage Treatment

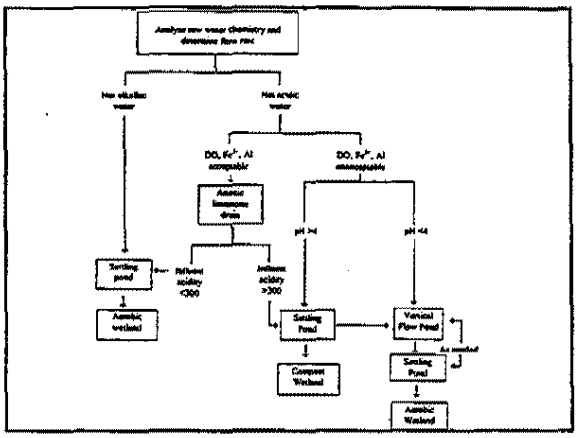
- Neutralize acidity
- Precipitate and retain metal solids
- Discharge effluent that is suitable for stream biota

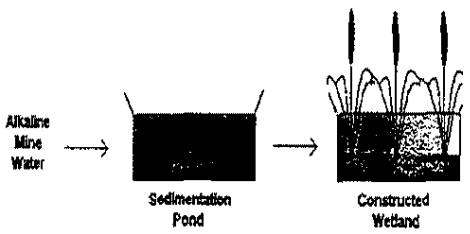
Passive systems utilize natural chemical and biological processes to decrease pollution without producing hazardous conditions or expensive O&M requirements.

Pros	Cons
• lower long-term treatment costs	• major up-front costs
• lower O&M costs	• large land requirements
• no use of hazardous reagents	• not suitable for all contaminant problems
• wastes are not hazardous	• less flexible than chemical systems
• ecological benefits	• many applications still experimental
• regulatory agencies increasingly prefer passive systems	

Success of passive treatment depends on the proper selection and sizing of passive techniques.

- Selection of treatment technique is dependent on water chemistry and effluent targets
- Sizing is primarily dependent on flow rates





Passive Treatment of Alkaline Mine Water

$4Fe^{2+}+O_2+8HCO_3^- \rightarrow 4FeOOH+8CO_2+H_2O$

- No alkaline reagents necessary
- Fe and Mn precipitate as oxides
- Goals are aeration and adequate retention
- Systems consist of ponds and wetlands designed to promote oxidizing conditions
- Fe removal much faster than Mn
- Potential for FeOOH recovery

St. Vincent Wetland #3

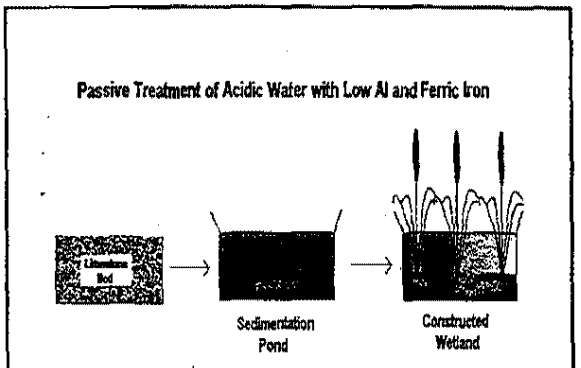
Date	Flow	Fe in	Fe out
Oct 99	79	84	0.4
Nov 99	132	98	1.1
Dec 99	na	90	3.3
Jan 00	337	93	6.8
Feb 00	315	125	4.4
Mar 00	100	100	1.2
Apr 00	na	94	1.4
May 00	na	85	1.0

Net Alkaline Water in PA

- Discharges from flooded Pittsburgh and Freeport coal mines in western PA
- Discharges from many flooded anthracite mines in central/eastern PA
- St Vincent College in Latrobe PA

Flooded Deep Mine Discharges in Western Pennsylvania

	flow	pH	acid	Fe	Mn	SO_4
Crab	4000	6.2	-41	70	3	850
Pos	2000	6.3	-209	32	<1	620
Lat	1000	6.2	-12	90	5	1000
Phil	4000	6.1	-71	81	3	988
Ced	100	6.3	-140	92	2	1250
Scot	1000	6.1	-37	62	1	547



Anoxic Limestone Drains

- **Bed of buried limestone that intercepts acidic water and generates alkalinity**
- **reliable production of 150-350 mg/L alk**
- **marine limestones with >85% $CaCO_3$**
- **12-30 tons of limestone per gpm flow**
- **most ALDs contain 300-3,000 tons of limestone**
- **possible to construct ALDs with years of limestone "reagent"**

Recognizing AMD that is right for an ALD

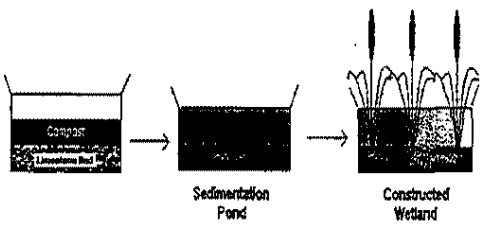
- pH at the discharge point is 5.0-6.0
- Bright orange color in seepage area
- pH below the seepage/orange area is <5
- THEN, collect a clean sample at the source and get it analyzed!

ALD-water in PA

- Artesian well discharges
- Some flooded deep mine discharges
- Brookville and Clarion Coal discharges
- Watersheds where ALDs are working
  - Headwaters of Slippery Rock Creek
  - Mill Creek/Little Mill Creek

Site	When, what	Influent	Effluent
114-B	1995, 300 tons	acid 20	Net alk 50
114-D	1995, 1300 tons	Acid 50	Net alk 80
101-A	1998, 900 tons	Acid 150	Net alk 50
Pit 601	1997, 2,800 tons	Acid 150	Net alk 150
Clar Prk	1990, 60 tons	Acid 400	Acid 100
Bird	1998, 600 tons	Acid 50	Net alk 150
HB	1991, 500 tons	Acid 500	Acid 350
SVC 1	1995, 4000 tons	Acid 150	Net alk 100

Passive Treatment of Acidic Water with Al and Ferric Iron



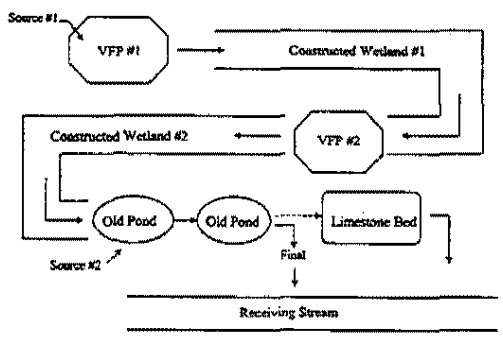
Vertical Flow Pond

- **concept originally developed by Doug Kepler and Eric McCleary as part of their *Sequential Alkalinity Producing System***
- **Typical Design**
  - 2-4 feet standing water
  - 1-3 feet of organic substrate
  - 1-3 feet of limestone aggregate
  - perforated drainage pipe placed at bottom of aggregate

Vertical Flow Ponds (SAPS)

- Procedure for generating alkalinity when an ALD is not appropriate
- System contains organic substrate, limestone and underdrain plumbing
- System is designed to resist plugging
- highest per ft^2 acidity removal rates
- Less reliable performance than ALDs

A Vertical Flow Treatment System in PA



Performance of Vertical Flow System

	Flow	pH	Alk	Acid	Fe	Al
Source #1	25	4.1	0	1062	366	34
VFP #1	24	6.0	175	341	176	<1
Wetland #1	na	3.1	0	281	25	<1
VFP #2	30	6.2	141	146	78	<1
Wetland #2	na	6.3	9	131	10	<1
Source #2	*9*	*5.5*	*0*	*535*	*17*	*10*
Final	40	6.2	9	180	<1	<1

Other Passive Treatment Techniques

- **compost wetlands**
- **limestone diversion wells**
- **open limestone channels**
- **limestone sand additions to acidic streams**
- **aerobic limestone beds**
- **proprietary microbial mixtures**

AVERAGE AMD UNIT PRICES - MAY 2000

Avg Of Mob Demob:	$13,979.87	lump sum
Avg Of Eros Sed Pol Con:	$1,126.55	per acre
Avg Of Office Facilities:	$282.84	per month
Avg Of Clearing Grubbing:	$1,256.14	per acre
Avg Of Wet/Pond Const:	$3.47	per cubic yard
Avg Of Pipe 4" PVC:	$6.38	per linear feet
Avg Of Pipe 6" PVC:	$7.40	per linear feet
Avg Of Pipe 8" PVC:	$10.72	per linear feet
Avg Of Pipe 8" butfly valve:	$1,002.63	per valve
Avg Of Aashto #57:	$10.52	per ton
Avg Of Aashto #1:	$13.88	per ton
Avg Of Spent mush compst:	$13.04	per cubic yard
Avg Of Geonet:	$2.17	per square yard
Avg Of flow control struc:	$6,183.75	per unit
Avg Of Imperv soil lining:	$16.01	per cubic yard
Avg Of ditch excavation:	$5.73	per cubic yard
Avg Of filter fabric:	$1.34	per square yard
Avg Of R-3 riprap:	$11.19	per square yard
Avg Of R-4 riprap:	$18.66	per square yard
Avg Of R-5 riprap:	$31.45	per square yard
Avg Of Soil cover:	$2.03	per cubic yard
Avg Of Imperv line (PVC):	$8.19	per square yard
Avg Of Seed bed prep:	$159.92	per acre
Avg Of Agricultural limestone:	$30.01	per ton
Avg Of Commercial fertilizer:	$203.62	per acre
Avg Of Nitrogen:	$0.45	per pound
Avg Of Phosphate:	$0.36	per pound
Avg Of Potash:	$0.30	per pound
Avg Of Seed Type - 1:	$3.75	per pound
Avg Of Seed Type - 2:	$6.27	per pound

LUNCH

PATRICIA GRIM

Growing Greener Foundation Luncheon

June 6, 2000

Tom Ridge, Governor
Commonwealth of Pennsylvania

James M. Seif, Secretary
Department of Environmental Protection

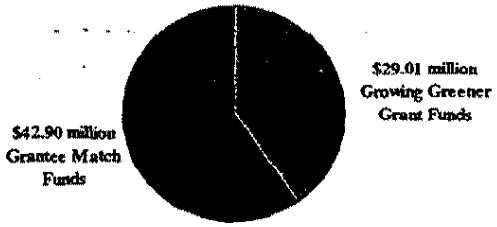
Round One Accomplishments

- 3,603 Acres of Wetlands Creation
- 117 Miles of Riparian Buffer Restoration
- 43 Miles of Stream Improvement Structures
- 795 Acres of AMD Land Reclamation
- 279 Miles of AMD Impacted Stream Improvements

Round One Accomplishments

- 85 Restoration Project Plans
- 58 Environmental Education Projects
- 55 Watershed Assessments and Protection Projects
- 21 Watershed Groups Organized

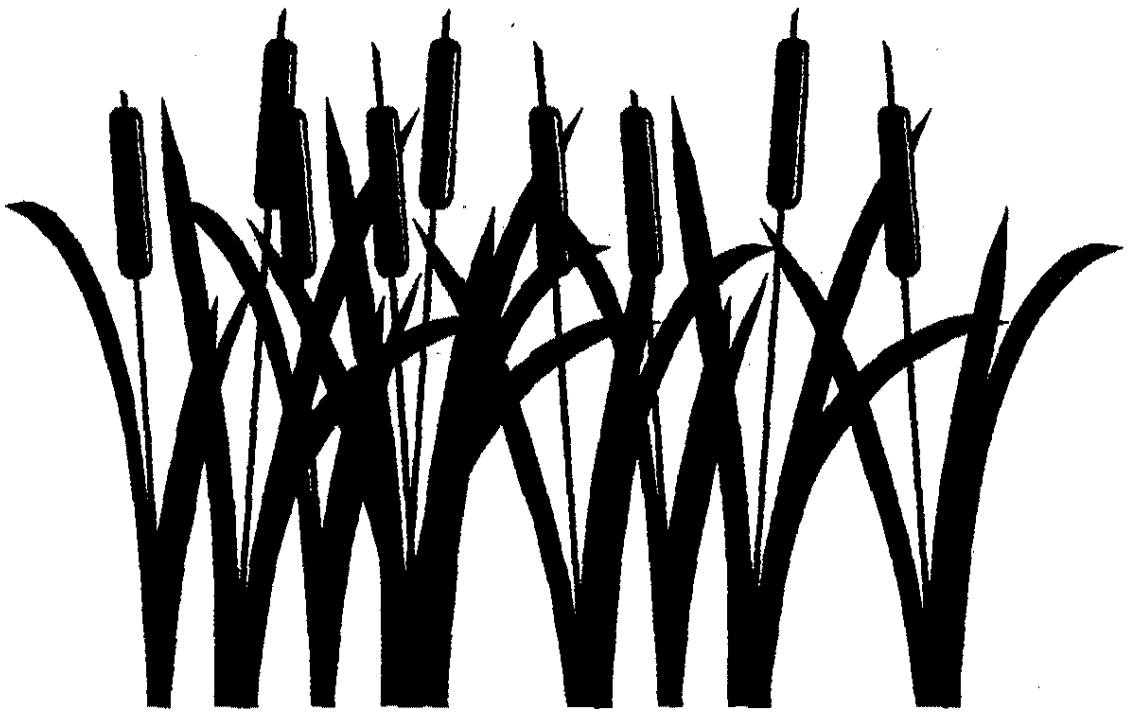
Making the Most of Growing Greener Grants



SESSION III

FROM DESIGN TO CONSTRUCTION

Pennsylvania's Second Annual Watershed Conference On Abandoned Mine Reclamation



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Session III: From Design to Construction

Bids, Permits, and Sites... *OH MY!*

Dan Sommarco, P.E., *PA DEP Bureau of Abandoned Mine Reclamation*
Craig Margus, *Schuylkill County Conservation District*
Tom Malesky, P.E., *PA DEP Bureau of Abandoned Mine Reclamation*

1

Outline

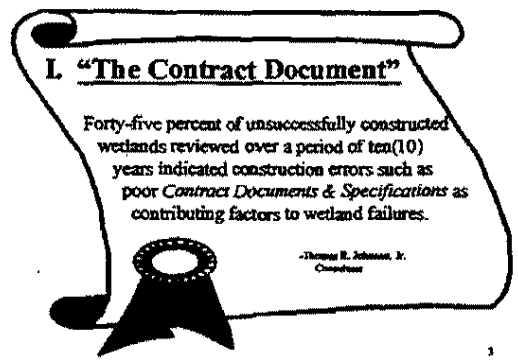
I. "The Contract Document"
- A. *General Conditions*
  1. *Bidding Requirements & Conditions*
  2. *Award & Execution of the Contract*
  3. *Conduct of Work*
  4. *Control of Work*
  5. *Payment*
- B. *Technical Specifications*
  1. *Engineer's Estimate*
  2. *Construction Drawing(s)*
  3. *Technical Specifications*

II. Permits

II. Case Studies

IV. Questions & Answers

2



I. "The Contract Document"

Forty-five percent of unsuccessfully constructed wetlands reviewed over a period of ten(10) years indicated construction errors such as poor *Contract Documents & Specifications* as contributing factors to wetland failures.

-Thomas R. Johnson, Jr.
Consultant

3

I. The Contract Document

A. General Conditions

1. Bidding Requirements & Conditions

- qualification of bidder
- estimate of quantities
- site investigation
- the "Bid Form"
- bid guaranty
- rejection of bids

I. The Contract Document

A. General Conditions (cont'd.)

2. Award & Execution of the Contract

- award of Contract
- execution of Contract Documents
- surety bonds
  - *performance bonds*
  - *material and labor payment bonds*
  - *maintenance bonds*

Start Stage #1, Sides B & Maintenance Bonds.

I. The Contract Document

A. General Conditions (cont'd.)

2. Award & Execution of Contract (continued)

- insurances
  - *worker's compensation insurance*
  - *public liability bodily injury & property damage insurance*
  - *automobile bodily injury & property damage*
- Notice to Proceed

I. The Contract Document

A. General Conditions (cont'd.)

3. Conduct of Work

- time and order of work
  - *pre-job conference*
  - *starting date / completion date*
  - *schedule of work*
- extension of time
- surveys / permits

I. The Contract Document

A. General Conditions (cont'd.)

3. Conduct of Work (continued)

- erosion & sedimentation control requirements
  - *Preparedness, Prevention, and Contingency Plan (PPC plan)*
- right-of-way (easements)
- temporary services during construction
- maintenance

I. The Contract Document

A. General Conditions (cont'd.)

4. Control of Work

- inspection
- major/minor changes and alterations
- Contractor's liability
- material samples requiring laboratory testing
- Remedy Guarantee Period

Acknowledge inspection will occur.

material samples - revegetation

I. The Contract Document

A. General Conditions (cont'd.)

5. Payment

- determination of quantities
- progress estimates
- final inspection and acceptance
- final payment

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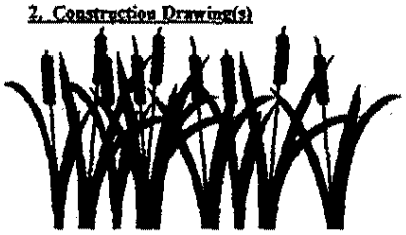
I. The Contract Document

B. Technical Specifications

I. "The Contract Document"
  A. General Conditions
  B. *Technical Specifications*
II. Permits
III. Case Studies
IV. Questions & Answers

1. Engineer's Estimate
2. Construction Drawing(s)



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Tech. Specs - Specific for topsoil project.

I. The Contract Document

B. Technical Specifications (cont'd.)

3. Technical Specifications

- mobilization and demobilization
- clearing & grubbing
- diversion & care of water
- wetland construction
- mining
- wetland treatment unit material
- flow control structures
- wetland planting
- seeding
- brush barriers / silts
- channel installation
- access road
- preparation & implementation of e & s control plan
- outlet treatment drain (if applicable)

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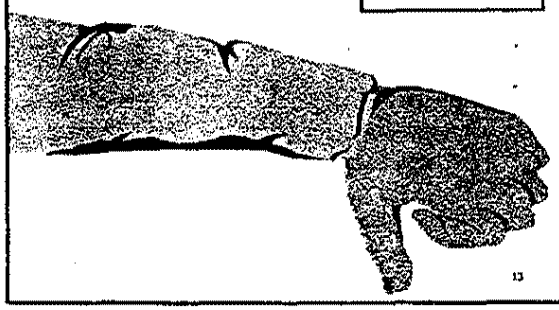
II. Permits

I. "The Contract Documents"
A. General Conditions
B. Technical Specifications
II. Permits
III. Case Studies
IV. Questions & Answers



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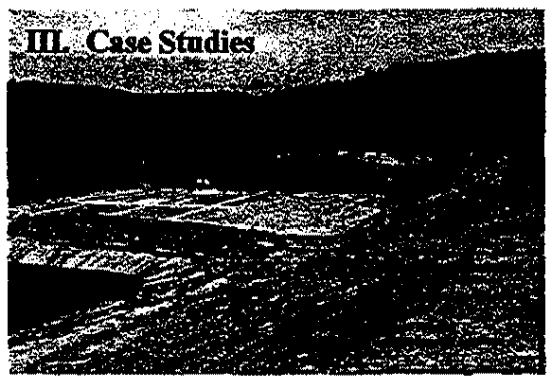
Todd Leshi

III. Case Studies



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Know Your Site:

Inspection
Record Keeping
Communication
- your own personnel
- Contractor
- Soil panel

Key Issues to Consider:

- Hydrological Conditions
- Soil Conditions
- Facility Management
- Final Inspection

I. Hydrological Conditions

Key Issues
I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

A. Mine Drainage

- Location
- Quality
- Quantity

B. Surface Run-off

- Handling temporary high flow
- Handling permanent high flow

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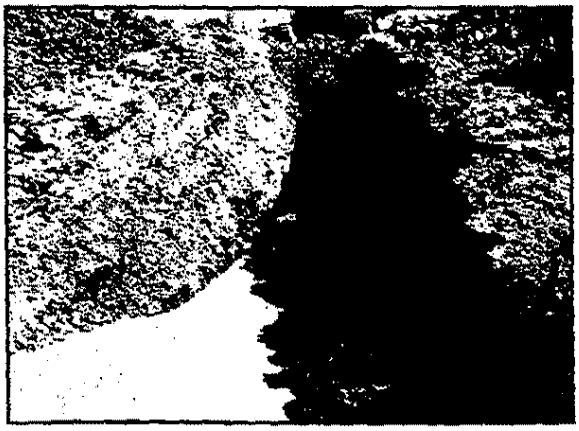
I. Hydrological Conditions

C. Subsurface Drainage:

- *Biggest Unknown*



Upon Discovery of Subsurface Drainage

1. **Identify**
   - Quality
   - Quantity
2. **Evaluate Effects**
   - Temporary
   - Permanent
   - Is it related to mine drainage?

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Modification to Plans

Communication

Negotiations

Change Orders

$$$

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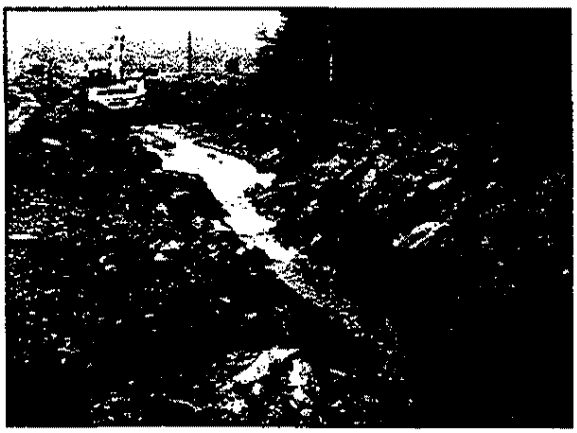

II. Soil Conditions:

A. On-Site Materials

- Suitable / Unsuitable

Key Issues
I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

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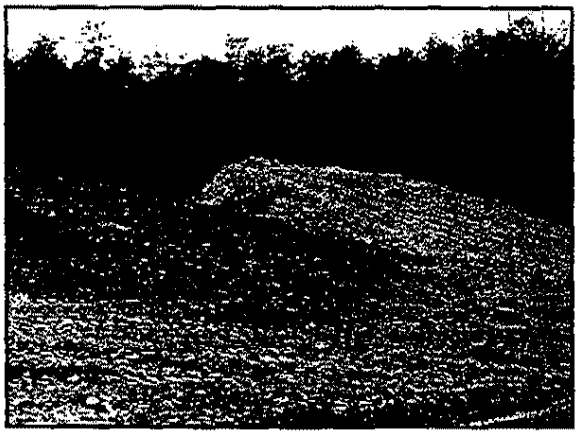

I. Soil Conditions

A. On-Site Materials (cont.)

- Volume
- Disposal/Waste
- Compactability
- Permeability

Key Issues
I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

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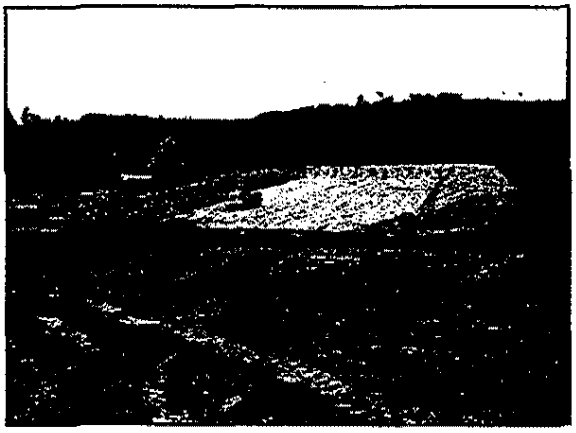

II. Soil Conditions:

B. Slope Stability

- Evaluate
- Control
- Corrective Measures

Key Issues
I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

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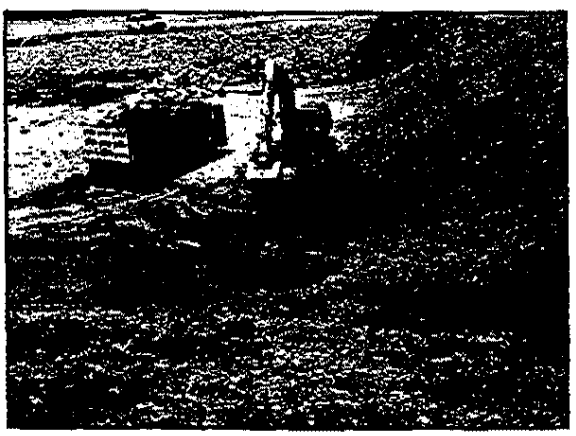

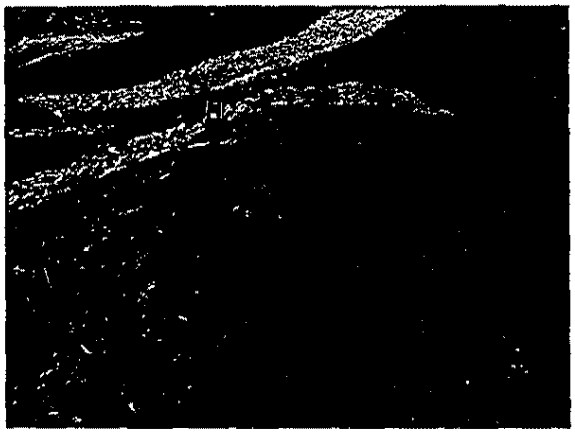

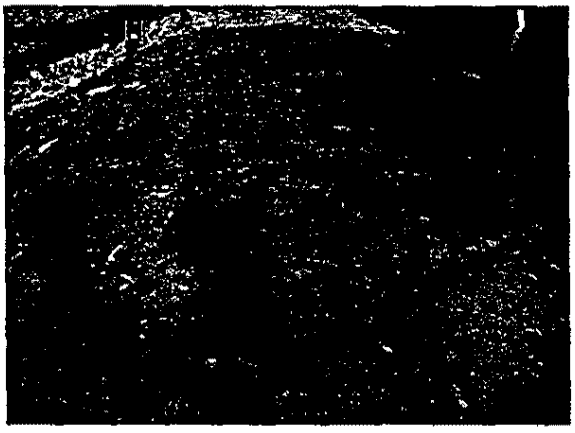

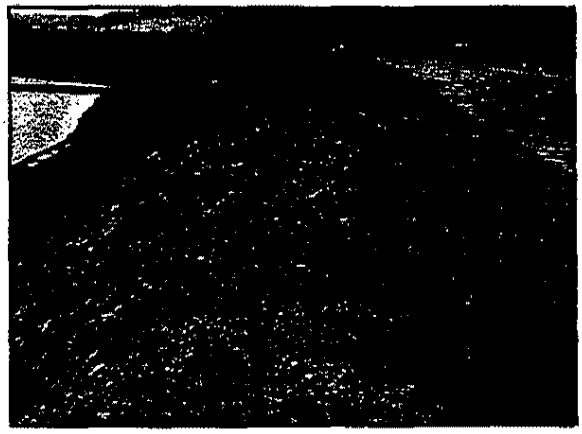

III. Facility Management:

A. Safety

- Embankments
- Water
- Retaining Walls
- Pipe
- Other Considerations

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III. Facility Management:

B. Odor

- Proximity to Homes

Key Issues
I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

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III. Facility Management:

C. Structures

- Placement
- Stability
- Protective measures:

Key Issues

I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

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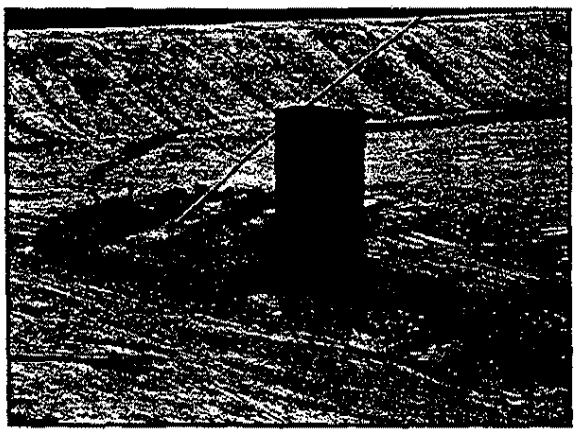

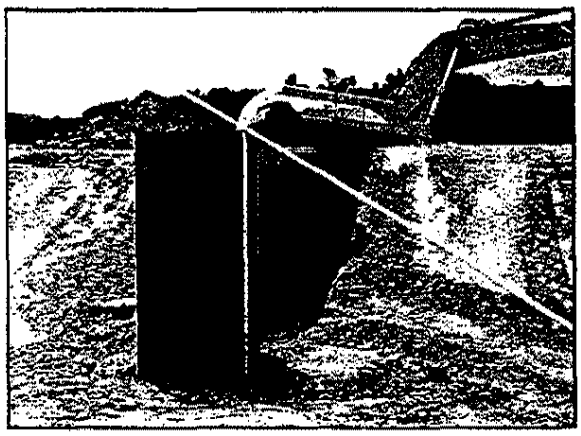

I. Facility Management

D. Outside Influence:

1. Vandalism
2. Critter Control
   - Embankments

Key Issues

I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

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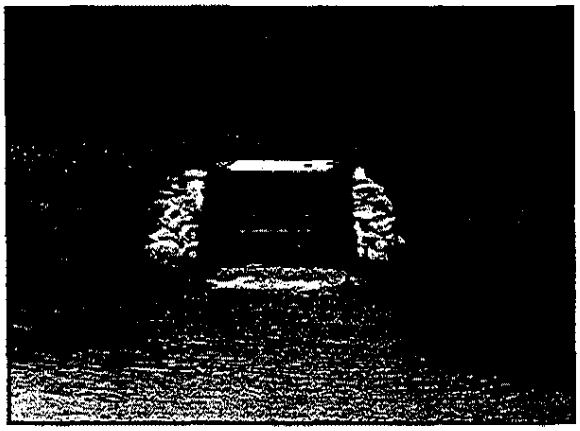

I. Facilities Management

- **Staging of Activities**
  - Vegetation

IV. Final Inspection

Key Issues
I. Hydrological Conditions
II. Soil Conditions
III. Facility Management
IV. Final Inspection

A. Test Impoundments

B. Be sure your site is what you need before contractor abandons it

C. Keep in mind accessibility for maintenance

- Ongoing monitoring, and vehicles / machinery

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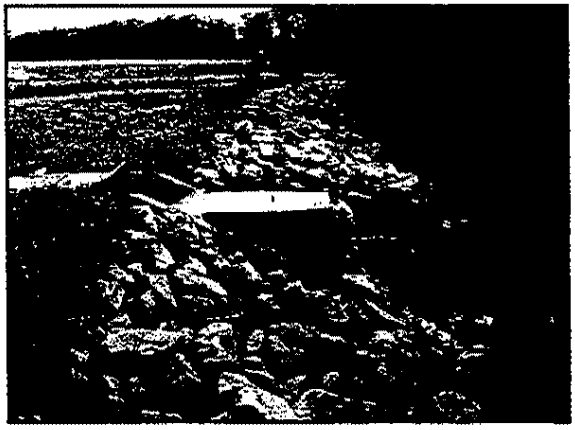
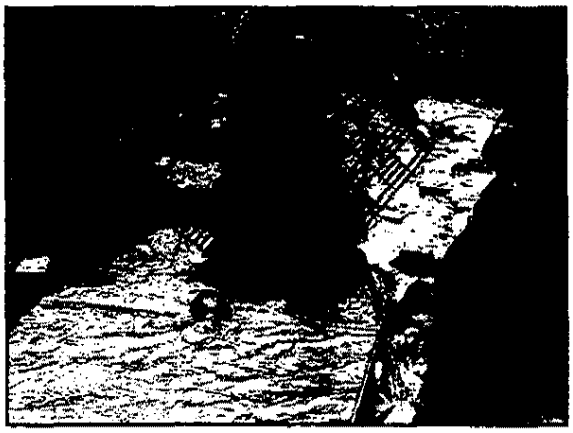
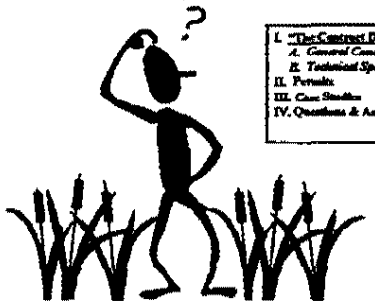




IV. Questions and Answers



SESSION IV

ONGOING STEWARDSHIP OF YOUR PROJECT AND ORGANIZATION

ONGOING STEWARDSHIP OF YOUR PROJECT AND ORGANIZATION: YOU'VE BUILT IT... NOW WHAT?

OPERATION & MAINTENANCE (O&M)

BY
PETER DALBY, Ph.D.
BIOLOGY DEPARTMENT
CLARION UNIVERSITY
CLARION, PA 16214
&
PRESIDENT
MILL CREEK COALITION OF
CLARION & JEFFERSON COUNTIES

Operation & Maintenance responsibilities for the Coalition fall into SEVEN ~~six~~ categories:

I. Water sampling regimen of the system and stream; biomonitoring.

II. Regular system maintenance.

III. Flushing regimen (if required).

IV. Ancillary maintenance/enhancement.

V. Clean-out of ponds, ditches, etc.

VI. ALD and/or SAPS replenishments.

VII. Back to the drawing board.

I. Water sampling regimen of the system and stream; biomonitoring

- With passive treatment systems, 3-6 months needed for equilibration.

- Many grants require a certain amount of post-treatment water sampling and stream biomonitoring.

- Sampling may be important to take after ALD and SAPS systems as well as prior to discharge into a stream. In addition, stream sampling above and below the discharge point may be informational.

- Once a treatment system is established and stabilized, a yearly monitoring plan needs to be developed and followed.

II. Regular system maintenance

- Check for clogged channels, water control boxes, etc. due to debris (leaves, branches, etc.) accumulation.

- Check for muskrat damage of breastworks, etc.

III. Ancillary maintenance

- Signage upkeep.
- Clean-out and maintenance of wood duck nestboxes, mallard duck and Canada goose nesting devices.
- Clean-out and maintenance of bluebird and tree swallow nestboxes.
- Trees and shrubs planted for wildlife food and cover may need some care their first few years.

IV. Flushing regimen

- Passive treatment systems which are affected by aluminum require routine flushing and need to follow a schedule determined by the designer or by evaluating treatment effectiveness of the system.

V. Clean-out of settling ponds and ditches

- Settling ponds eventually fill with metal oxides.
- Ditches become clogged with metal oxides, cattails, sedges, etc.
- Need to encourage the development of resource recovery systems.
- Need to "requester" funds, apply for grants, etc. to fund these major maintenance obligations.

VI. ALD and/or SAPS replenishments

- Recognize that several decades away, ALDs and SAPS will need replenishment. Funding???

- Systems may need to be redesigned to take advantage of new technologies.

- Keep in mind that water chemistry and loading characteristics are likely to be different in several decades.

VII. Back to the drawing board

- Realize that some systems will not meet performance expectations; additional AMD sources may appear during system construction, engineering or construction errors/decisions occur, etc. that affect performance.

- Consider a phased approach to an AMD problem.

A MODEL PLAN
FOR
WATERSHED RESTORATION

Developed by

Pennsylvania Department of Environmental Protection
Natural Resources Conservation Service
Army Corps of Engineers – Baltimore District
Army Corps of Engineers – Pittsburgh District
Office of Surface Mining Reclamation and Enforcement

with the participation of

Western Pennsylvania Coalition for Abandoned Mine Reclamation
Eastern Pennsylvania Coalition for Abandoned Mine Reclamation
Pennsylvania Department of Conservation and Natural Resources

January 1999

Preface

Governmental agencies, watershed organizations, environmental groups and other institutions involved in watershed restoration activities prepare some sort of plan to describe what must be done in the watershed. Each group has its own special needs based on legal requirements, institutional procedures or tradition. Many of the elements of these individual plans are common to all of the plans.

The purpose of this model is to define the common elements of a restoration plan which, if used by resource and funding agencies, will facilitate partnering and avoid reworking plans to suit individual agency processes. It is intended that the model can be used interchangeably among the agencies. Ideally, resource and funding agencies will modify their internal procedures and traditions to accommodate this model.

This model recognizes that the development of a watershed restoration plan cannot be done alone. It takes the cooperation and participation of all of the resource agencies involved in preparing this model. Watershed organizations, environmental groups and others should contact the resource agencies before much effort is made to develop a restoration plan. The agencies can provide guidance on data collection and evaluation and help to identify funding sources. In addition, public involvement is an important factor in building a successful restoration plan and public meetings should be held during the plan development process.

The Model Plan described below lists a number of elements that are essential to a comprehensive restoration plan. Any report which describes a plan for restoring a watershed must contain these elements. Further, a watershed report should have an Executive Summary which describes the value of the watershed to the area and the community, the problems in the watershed and the recommendations for addressing the problems.

PLAN ELEMENTS

I. WATERSHED DESCRIPTION *(What is the area like? Why is it important?)*

This element should include a map of the watershed showing the streams, cities, towns, major roads and the location of the watershed in relation to a major topographic feature or political boundary. Briefly describe the historical, archeological, geological and biologic features of the watershed.

Describe in detail the value of the streams in the watershed to the community and the region. This description should include the existing value and the potential value if the streams were restored. The value can be described in terms of usefulness for recreation (fishing, boating, swimming, etc.), for domestic and industrial water supply, for agriculture and for habitat maintenance and enhancement. It can be described in terms of importance as a resource for the communities in the area, within and outside the watershed itself. It also can be described in terms of worth when compared to adjacent or nearby watersheds.

II. PROBLEM IDENTIFICATION *(Why are we concerned about this area?)*

In order to determine how to proceed toward restoration, the problems within a watershed and the opportunities for improvement must be defined. Initially, the problems and opportunities should be defined in broad terms so that the overall "condition" of the watershed can be assessed. The problem identification should include all environmental problems associated with a watershed – mine drainage, sewage, non-point sources and point sources.

There are many sources of information about the quality of a watershed. Foremost among these are local residents who have spent their lives in the watershed. In addition, there are published reports and data that can be useful in assessing a watershed. Data sources include:

- 303(D) list of streams that are impaired. The 303(D) list is a list of streams with water quality standards violations for which Total Maximum Daily Loads (TMDLs) are still needed. The list is available from DEP Bureau of Watershed Conservation. The list includes:
    - streams with negatively impacted water quality.
    - a chemical determination that the stream does not meet water quality standards.
    - a rapid biological procedure report or full biological study that shows a poor aquatic community.
- Previously completed studies/surveys
    - Operation Scarlift
    - Corps of Engineers studies
    - USGS studies
    - DEP studies

- Fish and Boat Commission studies
- NRCS data
- Colleges and Universities
- Watershed associations and river basin commissions
- Local groups and organizations
- Industrial studies
- DCNR river conservation plans and river conservation implementation studies
- Private consulting firms

The above information will serve as a good "scientific" base for a broad assessment of the watershed. But the perceptions and feelings of local residents are equally as important. All stakeholders including the general public should be consulted in helping to define the problem. Generally, environmental problems in a watershed are related to land-use practices which impact water quality. Typical problems and concerns identified by local residents include:

- water quality deterioration
- water supply contamination or diminution
- aesthetics
- quality of life
- impact upon a need – i.e. recreation, site specific concern
- economic impact -- development opportunity lost
- land use issues -- zoning, redevelopment of mine lands and brownfields
- agricultural runoff
- diminished stream flow
- degraded aquatic and wildlife habitat
- flooding
- untreated wastewater and storm runoff
- public health and safety
- sediment deposition

III. SET BROAD EXPECTATIONS *(What would we like to accomplish?)*

Before a detailed plan can be formulated and specific objectives and solutions developed, the expectations, limitations, and capabilities of all the stakeholders must be identified. Public meetings should help identify these expectations. Expectations should evolve from:

- Landowners in the watershed
- Community groups
- State agencies
- Federal agencies
- Environmental interest groups
- Industries and businesses in the watershed
- National, state, and local political priorities

IV. DEFINE SPECIFIC PROBLEMS WITH ADEQUATE DETAILS *(Where are the problems and how do they impact the area?)*

In order to determine what needs to be restored, a detailed inventory of the problems within the watershed needs to be made. The impact of these problems must be assessed to determine which of the problems can be and should be addressed. Protocols for data collection should be established in consultation with potential funding sources. A data "Quality Assurance" plan should be available so that potential funding sources can have confidence in the data. All spatial data must be collected so that it is capable of being entered into a GIS system. The following factors should be considered in defining and assessing the problems in a watershed.

Data Collection and Analysis

- The biological condition of watershed.
    - Determined through a scientifically valid assessment procedure such as the EPA rapid bio-assessment protocols (See Rapid Bioassessment Protocols for Use in Streams and Rivers – EPA/440/4-89/001)
- The identification and location of all pollution sources that degrade water quality and aquatic and terrestrial habitat.
    - The collection of existing quality and quantity data on non-point (including abandoned mine) discharges.
    - The collection of existing data on permitted discharges and operations.
- The collection of existing data on water quality and quantity on the streams and tributaries in order to establish the "TMDL" and waste load allocations.
- Gaps in existing data will need to be filled by the various interest groups and governmental agencies.
- Collected data should include flow and water quality parameters and collection procedures - Information on how to collect this data can be obtained from the DEP Volunteer Water Quality Monitoring Office.
- Proposed land use changes.
- Other data required by NEPA and federal executive orders - see appendix.

Problem Assessment

- An assessment of the impact of the sources of pollution and other problems defined by the data collection must be made.
    - miles of stream impacted and how the impact was measured and determined.
    - impacts on existing and planned stream uses.
    - impacts on existing and planned land uses.
- Include "TMDL" for any parameters not meeting water quality standards in plan area/watershed. This information can be obtained from the DEP Bureau of Watershed Conservation.
    - Identify percent contribution from each source.

- Determine the allowable load to the various point and non-point sources using the Waste Load Allocation Process.
    - Identify percent reduction needed from contributing sources.
- National Environmental Policy Act evaluations.

V. SET SPECIFIC OBJECTIVES INCLUDING EVALUATION CRITERIA *(This is what we want to achieve!)*

Not all problems that are identified can be or should be addressed. The impact of some might be too small to worry about. The impact of others might be too costly to address. Realistic, achievable objectives must be established. For example: objectives could range from an ideal of achieving all possible stream uses; to achieving only those stream uses that are probable; to maintaining those stream uses that currently exist in the watershed. Objectives could call for the full restoration of aquatic habitat or could recommend treatment for only those discharges that restore a specific number of stream miles. Further, in establishing objectives, the policies of potential funding agencies should be considered. For example, an objective to provide an educational opportunity without achieving any water quality improvement may not satisfy the funding criteria of some environmental restoration agencies.

In setting objectives, the capabilities of the group or institution charged with long term operation and maintenance responsibility must be considered. If the O&M group can only manage one or two projects, there would be little point in planning to build five or six abatement projects. The restoration plan, therefore, should be limited to a watershed that would have two projects. Conversely, if the O&M group can manage multiple projects, a large watershed area could be considered.

Realistic objectives should include criteria for measuring the effectiveness and success of the restoration plan.

VI. PROJECT SCOPING *(These are the possibilities!)*

As the first step in determining which projects should be constructed, a scoping of the potential projects is needed. The scoping should:

- Evaluate the applicability of potential treatment/abatement technologies to the problems.
- Determine feasibility of constructing the project considering the space available, landowner agreements, the physical conditions at the site, the location of the source of the problem.
- Determine the cost of each potential project.

Any non-mining related problems should be referred to the appropriate bureaus or agencies for action.

VII. PLAN DEVELOPMENT *(These are the alternatives)*

Evaluate alternatives developed in project scoping to determine which (if any) can meet plan objectives in a cost effective manner.

- Analyze costs, benefits (in monetary and non-monetary terms) and worth of each potential project.
- Compare various combinations of individual projects that would meet plan objectives.
- Analyze the incremental cost of pollutant removal where needed for Corps of Engineers support.

VIII. RECOMMENDATIONS *(This is what should be done!)*

After the alternatives have been evaluated, specific projects are to be identified. It should be recognized that, most likely, only one project will be funded in a single year. Therefore, priorities for construction and funding must be established. The plan recommendation should:

- Select the preferred alternatives and establish priorities.
- Identify funding sources and constraints.
- Describe how the projects will be financed including a schedule.

IX. PLAN IMPLEMENTATION *(This is how it will be done!)*

The most important step in rehabilitating a watershed is the construction of the projects to treat or abate the pollution sources. Implementation also must be planned so that construction time frames match funding availability and resources are available to operate the facilities when they are available. An implementation plan should include:

- An implementation schedule.
- A commitment for funding at the needed time.
- A resource plan for long-term operation and maintenance.

X. ASSESSING PLAN EFFECTIVENESS *(Did we succeed?)*

The restoration plan needs to specify how the effectiveness of the plan will be assessed. This should include interim assessment as projects are constructed and long-term assessment after all projects have been completed. The plan should include:

- A monitoring plan for the watershed to measure long-term effectiveness in meeting the objectives.
- A monitoring plan for individual projects.
- A process to evaluate results and modify plan as appropriate.

APPENDIX A

Reserved for future use

APPENDIX B

Participants

(in alphabetical order)

Army Corps of Engineers

Stacey E. Brown	Baltimore District
Wesley E. Coleman	Baltimore District
Kathryn J. Conant	Baltimore District
John N. Goga	Pittsburgh District
Dave Ladd	Baltimore District
Edward J. Smith	Pittsburgh District

Department of Conservation and Natural Resources

Marian Hrubovak
James Mays

Department of Environmental Resources

Andrew Friedrich	Abandoned Mine Reclamation
Ernie Giovannitti	Abandoned Mine Reclamation
Dave Hogeman	Mining and Reclamation
Lee McDonnell	Watershed Conservation
John Meehan	Mining and Reclamation
Pamela Milavec	Abandoned Mine Reclamation

Natural Resources Conservation Service

Daniel R. Seibert

Office Of Surface Mining

David Hamilton

Eastern Pennsylvania Coalition for Abandoned Mine Reclamation

Robert Hughes

Western Pennsylvania Coalition for Abandoned Mine Reclamation

Mark Killar

Implementation of Pennsylvania's Comprehensive Plan for Abandoned Mine Reclamation

Input From.....

Robert Hughes
Eastern Pennsylvania Coalition for Abandoned Mine Reclamation

Mark Killar
Bob Ventorini
Western Pennsylvania Coalition for Abandoned Mine Reclamation

I. Organization of watershed organization.
   - A. Strive for local input.
   - B. Have either EPCAMR or WPCAMR come and talk to the group.
   - C. Establish possible partners.

II. Education of watershed organization.
   - A. Learn area of watershed.
   - B. Learn resources of watershed.
   - C. Learn chemistry, biology, physics of watershed (just the basics, use EPA's *A Citizen's Handbook to Address Contaminated Coal Mine Drainage* as a very good primer).
   - D. Contact County Conservation District and EPCAMR/WPCAMR for technical assistance.

III. Assessment of the watershed.
   - A. Define watershed using a map as a valuable reference (topo or GIS if available).
     1. Delineate watershed.
        - a. Determine drainage area (acres).
        - b. Determine stream miles.
     2. Define major communities.
     3. Define geology and soils.
     4. Define special features (*i.e.* fishing regulations, improvement projects, dams, waterfalls, industrial inputs/outputs, *etc.*).
     5. Define social, historic, and economic attributes.
     6. Define land use (*i.e.* forestry, agriculture, mining, and industry).
   - B. Identify major watershed problems.
     1. Abandoned mine drainage.
     2. Impacts to public water supply.
     3. Mine hazards (land problems).
        - a. Highwalls.
        - b. Open shafts.
   - C. Gather all available data.
     1. Mining permit information.
        - a. District Mining Office.

2. Topo map information.
    a. USGS.
3. Internet information.
    a. Computer.
4. Scarlift Report information.
    a. BAMR.
5. Problem Area Map information.
    a. BAMR.
6. Mine Map Repository information.
    a. OSM.
7. Fisheries Management Report information.
    a. Fish and Boat Commission.
8. Other information.
    a. ACOE.
    b. NRCS.
    c. USF&WS.
    d. County Conservation Districts.
    e. Colleges/Universities.
    f. Sportsmen's groups.
    g. Locals.
    h. Industry.

IV. Define a **MANAGEABLE** work area.

A. Use hydrologic sub-unit area to narrow the group's focus.

B. Perform a more detailed investigation of the pollution problem.

1. Establish a water monitoring program.
    a. Select representative monitoring sites.
    b. Have District Mining Office, Conservation District, or EPCAMR/WPCAMR assist with training/protocols and having water samples collected and analyzed.
        i. Field chemical parameters.
        ii. Lab chemical parameters.
        iii. Flow data.
2. Perform *very* rapid biological assessments (*i.e.* kick-net samples for macroinvertebrates).
    a. BAMR.
    b. EPCAMR/WPCAMR.
    c. Conservation Districts.
    d. Colleges/Universities.
    e. District Mining Offices.
    f. Fish and Boat Commission.

V. Prioritize problems.

A. Set rational goals.

1. Think of bringing back the stream to some reasonable use.
2. Think of a reduction in pollutant loadings.

B. Think small.
    1. Ask what are the benefits to be gained by achieving the goals.

VI. Develop a plan of action.
- A. Schedule.
- B. Assign responsibilities.
- C. Select a contact person - somebody to take charge of the plan.
- D. Obtain written landowner permission.
    1. Signed conservation easements.
    2. Determine if there any active mining permits/bonds.
- E. Determine what all the treatment alternatives are.
    1. EPACMR/WPCAMR.
    2. Conservation Districts.
    3. NRCS.
    4. BAMR.
    5. Private Consultants.
    6. District Mining Offices.
- F. After identifying all alternatives, decide which treatment option is most feasible and cost-effective.

VII. Line up funding.
- A. Identify all possible sources.
    1. Use EPA Citizen's Guide as a good primer.
- B. Identify partner contributions.
    1. Determine O & M costs and responsibilities.
    2. Obtain construction estimates, design/engineering plans, etc.
        a. NRCS.
        b. BAMR.
        c. District Mining Offices.
        d. Private Consultants.
- C. Approach funding sources.

VIII. Implementation.
- A. See WPACMR/EPCAMR Project Planning Flowchart.
- B. Establish goals and milestones.
- C. Determine who will do what and when.

IX. Measure successes.
- A. Determine MER's (measurable environmental results).
    1. Reduction in pollutant loadings.
    2. Enhancement or restoration of macroinvertebrate communities.
    3. Enhancement or restoration of fish communities.
- B. Determine partners established.
- C. More $ that may lead to another project.
- D. Increase in stream use.
    1. Recreation.
    2. Water Supply.