APPENDIX B

TREATMENT SYSTEM DETERMINATION GUIDE

The flow chart on page 17 was developed by Hedin and Nairn (1994) to help you select the appropriate treatment system depending on stream water chemistry and physical parameters.

Use the worksheet on this page as a rough guide in conjunction with the flow chart to review the possible treatment systems that may be appropriate for your stream. Keep in mind that selecting the appropriate system is highly dependent on a wide range of data collected over long periods of time. Monitoring over time will reveal how widely stream chemistry may vary—an important consideration depending on your treatment objectives.

IDENTIFY ACID SOURCE:

MEASURE STREAM CHEMISTRY

**pH**

- Period of record: __________
- Frequency of measures: _______
  - Average: __________
  - Minimum: __________
  - Maximum: __________

**Acidity**

____________________(mg/L)

**Alkalinity**

____________________(mg/L)

**Iron**

- Period of record: __________
- Frequency of measures: _______
  - Fe²⁺(mg/L)
    - Average: __________(mg/L)
    - Minimum: __________(mg/L)
    - Maximum: __________(mg/L)
  - Fe³⁺(mg/L)
    - Average: __________(mg/L)
    - Minimum: __________(mg/L)
    - Maximum: __________(mg/L)
  - Ratio of Fe³⁺ / Fe²⁺: __________

**Dissolved oxygen (D.O.)**

____________________(mg/L)

**Flow**

- Average: __________ (cubic feet per second)
- Peak storm flows: __________ (cubic feet per second)
- Low base flow: __________ (cubic feet per second)

Base flow occurs during the summer month when most to all of the flow in streams is due to groundwater input and not precipitation.

*Most acid water treatment systems cannot be designed adequately without water quality information at both very high and very low flows.*
Determining the flow rate, analyzing water chemistry, and calculating loadings

Determine DO content, ferrous/ferric iron ratio, and aluminum concentration.

Low flow: < 0.12 cfs
High flow: > 0.12 cfs

Net alkaline water

DO < 2 mg/L Fe^{2+}/Fe^{3+} < 0.1 Al^{3+} < 1 mg/L

Aerobic wetland, anaerobic wetland, or SAPS

Strip DO, precipitate metals

Net acid water

DO 2–5 mg/L Fe^{3+}/Fe^{2+} = 0.1–0.25

Aerobic wetland, anaerobic wetland, or SAPS

pH > 4.5

pH < 4.5

Aerate

Anoxic limestone drain (ALD)

Add alkalinity (anaerobic WL, OLC)

Settling pond

Anaerobic wetland or SAPS

Discharge

Chemical treatment or recirculate through ALD, SAPS, OLC, wetlands, etc.

Chemical treatment or recirculate through ALD, SAPS, OLC, wetlands, etc.

Key
Aerobic: With oxygen
Anaerobic: Without oxygen
Cfs: Cubic feet per second
DO: Dissolved oxygen
Fe: Iron
mg/L: Milligram per liter
OLC: Open limestone channel
SAPS: Successive Alkalinity Producing Systems
WL: Wetland