O&M Plan for the Ace Drilling, Site 26
October 2002

General System Layout The treatment system consists of a 3000 ton anoxic limestone drain (ALD) followed by two sedimentation ponds (SP-2 & SP-3), a constructed wetland consisting of four cells (1, 2, 3 and 4), and a 500 ton aerobic limestone bed (ALB). Two flows of mine water exist at the site: 26 Upper and 26 Lower. Both are collected into French drains that were constructed with non-calcareous aggregate. 26 Upper flows into and through the anoxic limestone drain. 26 Lower flows from the French drain into SP-3 where it mixes with the treated 26 Upper flow. The combined flows are transferred to the constructed wetland. Between Cell 3 and Cell 4, the water flows through the aerobic limestone bed. The discharge of the ALB flows into Cell 4 and through a final discharge channel to right fork of Gun Tree Run.

Operational Activities It is recommended that the system be inspected on a quarterly basis. Inspections should include the following items. All observations should be recorded on a dated sheet of paper that is filed in an appropriate location.

- All berms should be visually inspected to determine whether there is evidence of slumpage, seepage, or muskrat/groundhog burrowing. If evidence of berm failure is found, plans to repair the damage should be implemented.
- Flow rates should be measured for the system inflows and outflows. The inflow can be measured at the ALD effluent and the 26 Lower collection effluent. A final flow should be measured at the Cell 4 final effluent.
- Samples should be collected at each of the flow measurement points. For qualitative analyses, field pH and alkalinity will provide an indication of the general operation of the system. For quantitative measurements, analyses should include laboratory measurements of standard AMD parameters (acidity, sulfate, total Fe, Mn, and Al).
- The area around the ALD should be inspected for evidence of mine water seeps. Plugging of the ALD with metal solids will likely manifest as seeps that develop along the access road (north of the ALD) or along the ALD's western berm. If seeps are identified, their flow should be estimated, the system should be flushed aggressively, and the seeps should be re-inspected on a more routine basis.
- The effluent structures of each pond and constructed wetland should be inspected for blockage with debris or sludge. Blockage should be removed so that water flows smoothly between the system components.
- Sludge accumulation in the sedimentation ponds and constructed wetland cells should be monitored. When sludge accumulation begins to affect system performance by substantially decreasing retention times in the ponds and cells, sludge removal should be considered.
- The wetlands should be inspected for evidence of muskrat activity. Muskrats will consume vegetation, dig swimming channels that provide preferential flow paths, and dig holes into berms.
- The water elevation in the aerobic limestone bed should be inspected. Water should flow beneath the surface of the limestone aggregate. The depth of the water within the aggregate should be estimated.

Maintenance Activities Maintenance will be periodically required to assure that water flows through the system as intended and treatment occurs. Maintenance activities for the system components are presented below:

- ALD Accumulation of aluminum solids is likely to occur in the first one-third of the limestone bed. The solids should be removed through periodic flushing of the ALD. Three sets of flushing pipes have been installed. Each discharges through a valved pipe to SP-1. Opening of the valves should discharge a large volume of water and dislodge aluminum solids. Flushing protocols should be developed that remove the most solids. Initially, flushing each pipe for ten minutes every quarter is recommended. The site manager should observe the solids removal (aluminum hydroxides are white) and adjust the flushing protocols to remove the most solids.
- Sedimentation Ponds The sedimentation ponds are intended to fill with iron oxide solids. The ponds have a capacity to hold more than a decade of precipitate. If the retention of solids by the ponds is decreased by solids buildup, the iron sludge should be removed. Iron sludge is not hazardous. It can generally be pumped from the ponds and disposed of through on-site burial. Removal by a pigment company, at little cost to the system manager, may be feasible and should be explored.
- Constructed Wetlands The constructed wetlands must be maintained as an area with diffuse flow paths and thick vegetation. Infestation with muskrats should be avoided, through legal trapping if necessary.
- Aerobic Limestone Bed Water should flow through the limestone bed, not on top of it. Flow on top of the limestone is indicative of plugging of the limestone aggregate, probably through the accumulation of solids associated with metal oxide precipitation, algal growth, or plant litter. If the bed becomes plugged, and the performance of the treatment system declines undesirably, then the bed should be renovated by excavating and mixing it. Replacement of the limestone may not be required. The work can be accomplished with an excavator working from the bank or atop the limestone bed.

O&M Plan for the Ace Drilling, Site 26A
October 2002

General System Layout The treatment system consists of a vertical flow pond (VFP) containing 1000 tons of limestone, a sedimentation pond (SP-1), a constructed wetland (CW), and an aerobic limestone bed (ALB). The discharge of the ALB is the system's final discharge.

Operational Activities It is recommended that the system be inspected on a quarterly basis. Inspections should include the following items. All observations should be recorded on a dated sheet of paper that is filed in an appropriate location.

- All berms should be visually inspected to determine whether there is evidence of slumpage, seepage, or muskrat/groundhog burrowing. If evidence of berm failure is found, plans to repair the damage should be implemented.
- Flow rates should be measured for the system inflows and outflows. The inflow can be measured at the inflow to the VFP and at the effluent of the aerobic limestone bed.
- Samples should be collected at each of the flow measurement points. Because of the importance of the VFP, a sample from the VFP effluent should be considered. For qualitative analyses, field pH and alkalinity will provide an indication of the general operation of the system. For quantitative measurements, analyses should include laboratory measurements of standard AMD parameters (acidity, sulfate, total Fe, Mn, and Al).
- The water elevation in the VFP should be measured. The difference between the surface elevation of water in the pond and the top of the boards in the water level control box is the head loss of the system. Increasing head losses suggest plugging. An increase in VFP water levels that causes water to flow untreated over the emergency spillway should be avoided. A quick fix is obtained by removing boards from the box. Removal one board at a time is recommended. If board removal is not sufficient to prevent flow over the spillway, maintenance actions will be required.
- The effluent structures of the VFP, sedimentation pond and constructed wetland should be inspected for blockage with debris or sludge. Blockage should be removed so that water flows smoothly between the system components.
- The water elevation in the aerobic limestone bed should be inspected. Water should flow beneath the surface of the limestone aggregate. The depth of the water within the aggregate should be estimated.
- The VFP and wetland should be inspected for evidence of muskrat activity. Muskrats will consume vegetation, dig swimming channels that provide preferential flow paths, and dig holes into berms

Maintenance Activities Maintenance will be periodically required to assure that water flows through the system as intended and treatment occurs. Maintenance activities for the system components are presented below:

- VFP The accumulation of solids, both in the organic substrate and in the limestone aggregate, will decrease the porosity of the system and require increasing head pressure. Flow over the emergency spillway should be avoided. Increasing head requirements can be corrected in the following manners.
    - Changes in head requirements can be quickly and easily balanced by adjustment of boards in the water level control box.
    - The system can also be flushed by temporarily removing many boards from the box. Flushing is recommended if the head losses are more than three feet.
    - Permeability losses in VFPs sometimes result from the accumulation of an iron crust on/within the organic substrate. Mixing of the organic substrate with an excavator may be considered. Depending on the condition of the substrate, partial replacement may be necessary.
- Sedimentation Pond The sedimentation pond is intended to fill with iron oxide solids. The pond has the capacity to hold more than a decade of precipitate. If the retention of solids by the ponds is decreased by solids buildup, the iron sludge should be removed. Iron sludge is not hazardous. It can generally be pumped from the ponds and disposed of through on-site burial. Removal by a pigment company, at little cost to the system manager, may be feasible and should be explored.
- Constructed Wetland The constructed wetland must be maintained as an area with diffuse flow paths and thick vegetation. Infestation with muskrats should be avoided, through legal trapping if necessary.
- Aerobic Limestone Bed Water should flow through the limestone bed, not on top of it. Flow on top of the limestone is indicative of plugging of the limestone aggregate, probably through the accumulation of solids associated with metal oxide precipitation, algal growth, or plant litter. If the bed becomes plugged, and the performance of the treatment system declines undesirably, then the bed should be renovated by excavating and mixing it. Replacement of the limestone may not be required. The work can be accomplished with an excavator working from the bank or atop the limestone bed.

Exhibit A

Scope of Work and Budget:

Site: Cresson Mountain Treatment Project
Ace Drilling Acct # 545-02039 Trust
(Ace Drilling Coal Co. MDP 6576SM4)
Allegheny Township, Blair County

Guarantor shall collect water samples at the following points each **quarter** (approximately three months apart).

1. Site 26 composite of two pipes from ALD
2. Site 26 final discharge
3. Site 26a outlet from VFTP
4. Site 26a final discharge

Guarantor shall have the water samples analyzed at a certified lab for pH, alkalinity, acidity, SO4, Fe, Mn, Al, Suspended Solids.

Upon request by DEP, the Guarantor shall also analyze for ferrous iron and sample additional points such as the flush ponds for a mutually agreed fee.

Guarantor shall measure the flow **quarterly** (in gallons per minute) of water passing through pond 26 and measure or estimate flow through pond 26a

Guarantor shall flush both ponds **quarterly:**

1. Pond 26 ALD: flush three valves for ~15 minutes each (until flow clears up)
2. Pond 26a VFTP: flush one valve for ~ 10 minutes (until flow clears up)

Guarantor shall clean out the ALD outlet pipe and the VFTP outlet pipe with a plumbers snake **annually.**