

Grass Run Refuse

Submitted by:

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Project Name and Location:

Grass Run Refuse – Three Miles West of Weston, West Virginia, and One Mile North of Interstate 79

Name, Title Organization, address, Phone Numbers and E-Mail:

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Project Start and Completion Dates:

August 17, 1998 - July 11, 1999

Construction Costs and Funding Sources:

Appalachian Clean Streams Initiative -----	\$ 341,393
West Virginia AML Program -----	\$1,110,371
Total Cost -----	\$1,451,764

Contractor:

Alwood Company
Rt. 1 Box 462
Clarksburg, West Virginia 26301

Consultant:

Terradon Corporation
P. O. Box 519
Nitro, West Virginia 25143

West Virginia Department of Environmental Protection Staff:

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Grass Run Refuse

I. Background and Project Need

Located in north-central West Virginia, this 115 acre Lewis County site, about three miles east of Weston, was originally part of an abandoned coal preparation facility. On site were nine water treatment ponds; 30 acres of unvegetated, toxic coal refuse; and more than a half-mile of dangerous highwall. Several of these ponds were nearly full of slurry from eroded coal fines and sediment. A few of the ponds had breached, allowing most of their contents to wash downstream. Pond risers and pipes had either been completely destroyed or washed out, and none of the emergency spillways functioned properly. Uncontrolled run-off also severely damaged most of the drainage channels extending between each impoundment.

The ever-growing threat for catastrophic failure of one or more of these impoundments posed a definite risk to the health and safety of citizens living downstream. Even worse, heavy storm events had already caused serious flooding to several homes for people living along the receiving stream, Grass Run. In response to this flooding, the AML&R office immediately conducted an investigation on August 8, 1996, and discovered that one of the abandoned impoundments, filled primarily with coal refuse fines, was piping water and fines around the decant pipe. This condition caused the dam to become dangerously unstable. Shortly thereafter, in response to this emergency situation, the OSM approved a project to address the immediate problem by intentionally breaching the dam, thereby eliminating the danger; this emergency project was completed on August 22, 2002, at a cost \$12,560. Meanwhile, as more silt and refuse from the site's other unreclaimed areas continued to erode into Grass Run, further reducing its natural flow and capacity, the increasing likelihood of additional flooding continued to concern residents and local officials alike.

Another problem surrounded this site's production of acid mine drainage (AMD). As surface water migrated through the unvegetated coal refuse and spoil material, toxic levels of acid and metals such as iron, manganese, and aluminum leached into the ponds, ditches, and waterways. Gradually, this drainage flowed into Grass Run, and eventually on to Stonecoal Creek. What resulted was a severe reduction in downstream water quality. From this standpoint, departmental consultants ranked the Grass Run site as one of the ten worst AMD pollution sources in West Virginia.

The challenge of restoring abandoned mine lands to their original, pre-mined condition, while at the same time, minimizing environmental degradation during construction, has always been the goal of the West Virginia Department of Environmental Protection, Abandoned Mine Lands and Reclamation (AML & R) program. With this site, however, state officials also believed a unique opportunity existed to turn potentially life threatening and environmentally damaging slurry impoundments into productive wetland and wildlife habitat, while at the same time achieving its prime directive.

II. Reclamation Plan

During the summer of 1998, the AML & R office contracted with the Alwood Company to begin site restoration. The selected reclamation plan involved eliminating five of the nine abandoned water treatment ponds while repairing and enhancing the other four, backfilling 2,800 L.F. of dangerous highwall, regrading and soil covering 30 acres of toxic coal refuse, and constructing nearly two miles of drainage control channel. Several seeps, initially discovered at the base of the coal refuse pile located in the head of the hollow, were extremely high in acidity and metals, as well as sulfates. The planned combination of capturing this drainage through

II. Reclamation Plan (continued)

underdrains along with removing and/or covering slurry in each of the impoundments, promised to completely eliminate these pollution sources.

Because nearly all of the abandoned ponds had damage of one type or another, each structure had to be either repaired or eliminated. Here was the chance for AML & R engineers to not only correct the damage, but incorporate state-of-the-art wetland design features to improve wildlife habitat and increase species diversity. The selected plan involved construction of nearly four acres of new wetlands along with their associated splash pads, spillways, and nesting islands to attract migrating waterfowl. Overall, the selected plan involved:

- enhancing one freshwater pond located at the head-of-the-hollow
- eliminating five of the old water treatment ponds filled with metal precipitate and slurry
- converting the two largest treatment ponds into aerobic wetlands, and
- enhancing the two lower ponds for use as storm water detention basins.

Constructed at the toe of the large coal refuse pile, the first, smaller wetland provides long detention times thus promoting good precipitation of any leached-out metals. The second, larger wetland uses plants such as cattails and rushes to further reduce flow velocity, allowing even more metal extraction. By working together, these passive treatment systems generate a greater level of water quality improvement.

Another unique project feature was the strong reliance on a special type of drainage control system known as a grout blanket, lined channel. Approximately 10,000 L.F. of this leak-proof device was built to minimize surface water infiltration into the newly soil-covered coal refuse and slurry. AML & R engineers realized early on that this element was critical if AMD was to be eliminated at this site.

III. Reclamation Benefits

The Grass Run Refuse project resulted in one of West Virginia's best reclamation success stories from the standpoint of overall effectiveness. It not only eliminated the threat of flooding for residents along Grass Run, but also turned damaged water treatment ponds into valuable wetland habitat. The Grass Run project has already received two noteworthy awards and recognitions. These include the:

- West Virginia Mining and Reclamation Symposium, January 2000, Ducks Unlimited Wetland Award, and an
- Article published in "The Construction Management," November 2001, page 38, titled "AGC West Virginia Contractor Eliminates Acid Mine Drainage, Preserves Wetlands."

Residents along Grass Run Road, which parallels the creek, are delighted that flooding has completely stopped since completion of this project. Water quality improvements for both residents and wildlife along Stonecoal Creek, and further downstream in the West Fork River, were also realized. Because the West Fork serves as a source of drinking water for thousands of downstream residents in communities along its course, the resulting improvement in water chemistry had tremendous, multi-county benefits, going far beyond those realized by most other AML reclamation projects.

Table 1 below illustrates the improvements in pH, acidity, and several other chemical parameters. These data were collected at numerous points throughout the site. Each sample point is labeled on the accompanying map, which is attached in jpeg format as Photo #1. Of particular importance is Sample Point # 2, where the lower detention pond discharges directly into Grass Run. Analyses of samples collected before and after reclamation at this location clearly illustrate the remarkable improvement in water quality at the Grass Run site. The resultant alkalinity has not only neutralized all of the original acid mine drainage, but when combined with the area's upstream, natural alkaline drainage, the resulting net increase in alkalinity further helps to improve water quality in many additional miles of waterway. Similarly,

III. Reclamation Benefits (continued)

the reduction in metals discharging from the Grass Run Refuse site is also quite striking.

Table 1: Grass Run Refuse Water Quality Data

Sample ID	Date	Lab pH	Hot Acidity mg/l as CaCO ₃	Alkalinity mg/l as CaCO ₃	Total Al mg/l	Total Fe mg/l	Total Mn mg/l
2	6/1/96 *	3.00	245.00	0.00	5.40	55.40	20.00
2	12/11/00	7.10	0.00	83.00	0.00	0.60	1.77
2	10/29/01	7.23	0.00	98.12	0.18	0.31	1.59
25	12/11/00	7.10	0.00	80.00	0.63	2.44	1.03
50	12/11/00	7.70	0.00	173.00	0.00	0.00	0.00
50	10/29/01	7.64	0.00	199.92	0.00	0.00	0.00
100	12/11/00	7.50	0.00	70.00	0.00	0.00	1.00
100	10/29/01	7.59	0.00	85.36	0.00	0.11	0.00
200	12/11/00	7.40	0.00	86.00	0.00	0.00	1.59
200	10/29/01	7.53	0.00	110.10	0.00	0.00	0.00
300	12/11/00	7.40	0.00	76.00	0.00	0.00	2.91
300	10/29/01	7.43	0.00	109.44	0.19	0.39	7.28
400	12/11/00	6.60	0.00	65.00	0.00	37.00	7.79
400	10/29/01	5.85	156.80	22.94	0.15	116.90	24.40
500	12/11/00	6.40	0.00	23.00	0.85	1.50	3.77
500	10/29/01	6.17	13.28	9.76	0.65	1.00	2.68
510	12/11/00	7.50	0.00	165.00	0.00	0.00	0.00
530	12/11/00	3.70	271.00	0.00	1.00	170.30	4.21
530	10/29/01	3.30	103.60	0.00	1.40	250.90	6.20
600	12/11/00	6.90	0.00	55.00	9.26	7.93	0.88

* Pre-construction data.

This project's creation of new, productive wetland also generated additional environmental and biological benefits. These include:

- improved soil conservation
- increased siltation and erosion control
- new fish habitat
- flood potential reduction through increased surface water storage
- recreation enhancement
- groundwater recharge, and
- increased biodiversity.

Most any day, visitors can readily observe beaver and muskrat activity throughout the site. A variety of ducks, Canada geese, herons, and other waterfowl now frequent the area. Migrating birds nest and raise their young on both of the site's two larger detention ponds. Whitetail deer and even coyote also inhabit this once barren and environmentally degrading abandoned mine land site.

Attached are five before and after photographs. These pictures further attest to this project's success and plainly display the astounding transformation achieved through its approach to innovative reclamation. Captions for each photograph and the map displaying water quality sample points are noted below.

Photo #1

Grass Run Refuse Water Quality Sample Points Map (refer Table 1 in the text).

Photo #2

Beautiful, post-reclamation aerial view showing various stages of AMD treatment. Both wetlands are visible in the photo's lower section, and the two detention ponds are shown downstream, at upper center. As AMD flows through the wetlands and on to the detention ponds below, dissolved metals such as iron gradually precipitate. This creates the brown to blue color change, thus indicating that the passive treatment system is functioning properly.

Photo #3

Second pond with damaged principle spillway. Debris atop riser indicates water level prior to failure and subsequent flooding. This structure was repaired and converted into the lower detention pond.

Photo #4

Series of old treatment ponds and coarse coal refuse dam. These potentially hazardous structures were eliminated during reclamation.

Photo #5

Post-reclamation aerial view looking upstream towards the head-of-the-hollow. Several thousand feet of grout blanket, lined channel clearly shown. Coal processing treatment ponds were eliminated in this area.

Photo #6 – Cover Photo

Picturesque, downstream post-reclamation view of wetlands and detention ponds. Please note the downstream residential development shown near the photo's upper left corner. It is these families and individuals that most benefited from reclamation which eliminated future flooding.