SR286 Passive Treatment System

A Public-Private Partnership Effort

Aultmans Run Watershed
Center Township
Indiana County, Pennsylvania

June 2005

SR 286 Passive Treatment System: FINAL REPORT

Aultmans Run Watershed
Center Township, Indiana County, PA

"Making it Happen" through a Public-Private Partnership Effort

A Pennsylvania Growing Greener Watershed Restoration Project

Brief Description of Project Work through Grant and Partnership Contributions

- Completed and submitted to appropriate agencies, applications and notifications including Environmental Assessment, Cultural Resource Notice, Highway Occupancy Permit, Single & Complete Project Screening (PASPGP-2), General Information Form, General Permit Registration, Intake & Outfall Structures (GP-4), PA Natural Diversity Inventory Search, Endangered/Threatened Species information requests, Erosion and Sediment Pollution Control Plan, PA One Call request; received permits/approvals;
- Installed E & S Controls approved by Indiana County Conservation District (ICCD);
- Assisted in qualitative watershed assessment with the PA DEP Bureau of Mining and Reclamation and Cambria District Mining Operations (assistance provided by Stream Restoration Inc. as contributions in-kind);
- Designed a passive treatment system for alkaline, metal-laden drainage (SR286 Discharge) from an abandoned underground mine to enhance precipitation of iron and settling of particulates prior to entering Aultmans Run; design based on limited project area and raw water monitoring of SR286 discharge by Amerikohl Mining Inc. and BioMost, Inc. with the following parameters: 103 gpm and 16 mg/l total Fe;
- Construction included creation of a multi-component (in series) passive treatment system including a Forebay (1,000 SF) and Aerobic Wetland (25,700 SF); existing, impacted wetland enlarged, reconfigured to include micro-topographical relief, and planted with native vegetation by volunteers;
- Constructed wetland "plumbed" onto existing channel wetland to provide additional treatment;
- Collected and planted live stakes of Black Willow and Silky Dogwood with volunteers to develop structural diversity and help create shade as part of the wildlife habitat;
- Developed preliminary Project Page on Datashed (www.datashed.org) for use by AWARE and others;
- Conducted education and outreach programs including wetland plantings by volunteers;
- Conducted tours; kept photographic log; submitted quarterly status reports and final report; administered contract.

Grant Program and Funding: Environmental Stewardship and Watershed Protection Grant (Growing Greener) - $93,455

In-Kind/Matching: Aultman Watershed Association for Restoring the Environment; Western Pennsylvania Watershed Program; Aquascape; Beran Environmental Services, Inc.; BioMost, Inc.; Stream Restoration Inc.

PUBLIC-PRIVATE PARTNERSHIP EFFORT

Landowner Support
John Stilley, Penn Twp., Butler Co., PA

Conceptual and Engineering Design of Passive Treatment System, Water Quality Monitoring, Highway Occupancy Permit, and Wetland Plantings
BioMost, Inc., 3016 Unionville Rd., Cranberry Twp., 16066
DANEHY, Timothy, QEP; DUNN, Margaret, PG; BUSLER, Shaun, GISP, Biologist; DENHOLM, Cliff, Environmental Scientist; DURRETT, Kyle, Intern (724) 776-0161

Water Monitoring, Stream Assessment
PA Department of Environmental Protection, Bureau of Mining & Reclamation, Rachel Carson State Office Building, PO Box 8461, Harrisburg, PA 17105-8461
ALEXANDER, Scott, Water Pollution Biologist (717) 783-9579

Environmental Assessment
Aquascape, 200 Neville Rd., Neville Island, PA 15225
JESSLOSKI, Dave, Director; BERAN, Robert, Wetland Scientist; REIDENBAUGH, Jeff, Env. Sci.; SALMON, Cody, Biologist; McANNICH, Anna, Biologist; MATHIAS, Karl, Env. Studies; LANICH, Kim, Env. Biologist (412) 777-6717

Pre-Construction and "As-Built" Surveys
William A. Altimus, PLS, PE, Surveying and Engineering, 81 East Pike, Indiana, PA 15701
ALTIMUS, William, PLS, PE; BURKETT, Donald, Draftsman (724) 465-7501

Passive Treatment System Construction
Amerikohl Mining, Inc., 202 Sunset Drive, Butler, PA 16001
STILLEY, John, President; JOHNSON, Fred, Foreman (724) 282-2339

Wetland Planting
Beran Environmental Inc., 2322 West Sunbury Rd., Boyers, PA 16020
BERAN, Robert, President; SALMON, Cody, Biologist; McANNICH, Anna, Biologist (724) 735-2766

Construction Inspection and State Grant Administration
PA DEP, District Mining Operations, 286 Industrial Park Road, Ebensburg, 15931
CRITTENDEN, Malcolm, Watershed Manager; ALLISON, Joseph, Monitoring and Compliance Chief; BARNES, Donald, Dist. Mining Mgr. (814) 472-1900

Watershed Assessment, Public Outreach, Volunteer Effort, Water Monitoring, and O & M
Aultman Watershed Association for Restoring the Environment (AWARE), Box 27, Kent, 15752
OKEY, Brian, President; CALVETTI, Paul, Vice-President; MARSHALL, Ken, Treasurer; CUMMINS, Carol, Secretary

Grant Administration, Education and Public Outreach, Volunteer Effort
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DANEHY, Timothy, QEP; DUNN, Margaret, PG; BUSLER, Shaun, GISP, Biologist; DENHOLM, Cliff, Environmental Scientist; DURRETT, Kyle, Intern (724) 776-0161

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Submitted to

Pennsylvania Department of Environmental Protection

EXECUTIVE SUMMARY

Aultman Watershed Association for Restoring the Environment (AWARE), Stream Restoration Inc., and supporters of the SR 286 Passive Treatment System implemented a grant from the PA Department of Environmental Protection through the Commonwealth's Growing Greener initiative. The purpose of the grant was to fund, in combination with matching/in-kind contributions, the installation of an environmentally-friendly system to treat an iron-bearing discharge and to provide related educational and public outreach activities.

The permitting/notification process was initiated on 11/06/02, within a week of the 10/30/02 execution of the Growing Greener Grant. All permits/approvals were received within a year (11/21/03). Construction was completed within a month (12/16/03 to 01/09/04) and AWARE volunteers assisted in the wetlands plantings on 04/24/04, 07/17/04, and 06/24/05. The timely project implementation and use of resources were made possible by cooperation through a public-private partnership effort that included federal, state, and local agencies; private industry; nonprofits; landowners; and volunteers.

A channel, reportedly constructed by the PA Department of Transportation in the 1940s, conveyed piped effluent from an abandoned underground mine to Aultmans Run. This channel, over time, became a degraded wetland. The passive system was designed to improve and to enlarge the existing channel wetland (11,000 ft^2) by utilizing the available construction area bounded by State Route 286, Aultmans Run, a non-degraded wetland, and an unnamed tributary. The multi-component system includes a 1,000-ft^2 forebay and a 25,700-ft^2 aerobic wetland. The lower portion of the existing channel wetland provides additional treatment to the mine drainage prior to entering Aultmans Run. Pre-construction monitoring by AWARE volunteers and others identified that the average annual metals loading of the discharge to be 15,000 lbs. Based on limited post-construction monitoring, the abandoned mine is currently discharging over 6,300 lbs./yr. of metals.

SR 286 Passive Treatment System Performance Summary

Sample Point	Flow (gpm)	pH (field/lab)	Alkalinity (field/lab)	Acidity	Fe	Mn
SR286 AMD *(raw)*	NM	6.2/6.5	91/78	-41	15	1
Ex. channel wetland *(treated)*	143	7.0/7.0	75/68	-53	4	1

Average alkalinity, acidity, and dissolved metals in mg/L; not measured – NM; average pH values not determined from H-ion concentrations; (post-construction monitoring n=6; See monitoring sheets for both pre- and post-construction monitoring data.)

The passive system successfully treats the mine water and also provides enhanced wildlife value by including microrelief, woody debris, deep pools, and live stakes in the wetland design. Successful vegetation was made possible by the generosity and commitment of AWARE volunteers.

This project, the first passive system within the Aultmans Run Watershed, has generated enthusiasm both within the watershed group and local community. Education and outreach activities have included tours, presentations, and newspaper and website articles. Highly visible from State Route 286, the site continues to be a model for future restoration efforts through the educational kiosk, tours by AWARE, and monitoring by Indiana University of PA students.

COMPREHENSIVE TIMELINE

Tour/Site Event News Item

Abbreviations: PA Department of Environmental Protection **(PA DEP)**; Aultman Watershed Association for Restoring the Environment **(AWARE)**; Amerikohl Mining, Inc. **(AMI)**; Western PA Watershed Program **(WPWP)**; Aquascape **(AQ)**; PA Fish & Boat Commission **(FBC)**; Indiana County Strategic Planning Commission **(ICSPC)**; US Dept. of Interior Fish & Wildlife Service **(FWS)**; Indiana County Conservation District **(ICCD)**; PA Department of Transportation **(PennDOT)**; PA Game Commission **(PGC)**; PA Bureau of Forestry **(PBF)**; PA Historic and Museum Commission **(PHMC)**; Passive Treatment System **(PTS)**; BioMost, Inc. **(BMI)**; Stream Restoration Inc. [non-profit] **(SRI)**

Date	Description	Correspondence	
		From	To
01/21/01	Participate in AWARE meeting		
01/29/01	Field meeting with AWARE members (in-kind by AMI & SRI)		
02/19/01	Participate in AWARE meeting (in-kind by AMI & SRI)		
03/06/01	Field meeting with PA DEP (in-kind by AMI & SRI)		
03/09/01	Submit Growing Greener Grant request	SRI	PA DEP
08/03/01	Denial of Growing Greener Grant request	PA DEP	SRI
08/16/01	Qualitative watershed assessment with PA DEP-BMR & DMO (in-kind by AWARE & SRI)		
08/17/01	Qualitative watershed assessment with PA DEP-BMR & DMO (in-kind by AWARE & SRI)		
08/30/01	Site water monitoring (in-kind by SRI/AMI)		
08/30/01	Qualitative watershed assessment with PA DEP-BMR & DMO (in-kind by AWARE & SRI)		
08/31/01	Qualitative watershed assessment with PA DEP-BMR & DMO (in-kind by AWARE & SRI)		
10/15/01	Participate in AWARE meeting (in-kind by SRI)		
11/02/01	Coordination meeting (in-kind by SRI)		
11/05/01	Participate in AWARE meeting (in-kind by SRI)		
12/17/01	Participate in AWARE meeting		
01/21/02	Participate in AWARE meeting		
02/08/02	Submit Growing Greener Grant request	SRI	PA DEP
03/19/02	Annual reimbursement questionnaire	PA DEP	SRI
04/16/02	Submit completed reimbursement questionnaire	SRI	PA DEP
07/15/02	Participate in AWARE meeting		
08/07/02	Award of Growing Greener Grant ME# 3521111; SW20243	PA DEP	SRI
08/15/02	Award of grant (matching funds)	WPWP	SRI
08/19/02	Participate in AWARE meeting		
09/16/02	Participate in AWARE meeting		
09/24/02	Request extension of grant execution paperwork	SRI	PA DEP
10/03/02	Water quality monitoring by BMI		
10/03/02	EDM survey by AWARE members William Altimus/Don Burkett		
10/17/02	Water quality monitoring		
10/21/02	Participate in AWARE meeting		
10/24/02	Complete GG Goals & Accomplishments Worksheets		
10/30/02	Submit executed grant agreement	SRI	PA DEP
11/06/02	Submit completed PNDI Search Form	AQ	ICCD
11/13/02	Underground utility location request	SRI	PA One Call
11/15/02	Response to underground utility location	PA One Call	SRI

11/18/02	Participate in AWARE meeting		
11/25/02	PNDI Search - no species of special concern	PBF	SRI
11/26/02	Notify of intent to build passive system	AQ	ICSPC
11/27/02	Notify of intent to build passive system	SRI	Center Twp.
11/27/02	Submit General Information Form	AQ	ICCD
12/05/02	No threatened/endangered species	FWS	AQ
12/12/02	No threatened/endangered fish, etc.	PFC	AQ
12/19/02	Water quality monitoring by BMI		
12/24/02	PNDI Search Number N111541 [J. Snyder, PA DEP]	PA DEP	AQ
01/03/03	No threatened/endangered birds/mammals	PGC	AQ
01/15/03	Forward executed Growing Greener Grant	PA DEP	SRI
01/19/03	Submit working capital request	SRI	PA DEP
02/17/03	Participate in AWARE meeting		
03/16/03	Complete Highway Occupancy Permit Application	BMI	PA DEP
03/21/03	Groundbreaking attended by 24 community members		
03/---/03	Groundbreaking article in Indiana Gazette newspaper		
03/---/03	Groundbreaking article in Blairsville Dispatch newspaper		
03/---/03	Groundbreaking article in Pittsburgh Tribune Review newspaper		
03/---/03	Groundbreaking article in AWARE Watershed News		
03/31/03	Fax and letter re: landowner & applicant	AQ	PA DEP
04/---/03	Article in *The Catalyst* (Slippery Rock Watershed Coalition)		
04/17/03	Submit Jan.-Mar. 2003 Quarterly Report	SRI	PA DEP
04/25/03	EA Administrative Incompleteness Review Letter	PA DEP	AQ
05/01/03	Submit Cultural Resources Notice	AQ	PA DEP
05/06/03	Response to EA Administrative Incompleteness Review	AQ	PA DEP
05/07/03	Submit EA/Restoration Waiver Additional Documentation	AQ	PA DEP
06/11/03	No historic or archaeological impact (ER 03-1635-063-B)	PHMC	AQ
07/10/03	Submit Apr.-Jun. 2003 Quarterly Report	SRI	PA DEP
07/15/03	Notify intent to file GP-4	SRI	Center Twp.
07/15/03	Notify intent to file GP-4	SRI	ICSPC
07/17/03	Submit GP-4 and E & S Control Plan	SRI	ICCD
07/21/03	Participate in AWARE meeting		
08/21/03	Approved E & S Plan (GP #043203205)	ICCD	SRI
08/21/03	Forward receipt of General Permit	ICCD	SRI
08/26/03	Submit E & S Control Plan	SRI	PennDOT
08/27/03	Response to Environmental Assessment Review Letter	AQ	PA DEP
09/15/03	Participate in AWARE meeting		
10/02/03	Submit Application for Highway Occupancy Permit	SRI	PennDOT
10/15/03	EDM survey by AWARE members William Altimus/Don Burkett		
10/15/03	Submit Jul.-Sep. 2003 Quarterly Report	SRI	PA DEP
10/20/03	Participate in AWARE meeting		
10/28/03	Restoration (wetland) waiver issued (DEP File NO. EA32-005SW)	PA DEP	SRI
11/03/03	Site visit - Richard Gill (PennDOT) - Highway Occupancy Permit		
11/04/03	1st Reimbursement Request (Period 08/08/02 to 08/29/03)	SRI	PA DEP
11/15/03	Site tour part of AWARE Cider & Sampling Event		
11/21/03	Approved Highway Occupancy Permit (#10012722)	PennDOT	SRI
12/08/03	Submit approved Highway Occupancy Permit (#10012722)	SRI	PA DEP
12/16/03	Construction Begins on SR 286 PTS		
01/08/04	Field Inspection; major construction of WL completed		
01/09/04	Construction completed and equipment removed from site		
01/14/04	Submit Oct.-Dec. 2003 Quarterly Report	SRI	PA DEP
02/13/04	2nd Reimbursement request (Period 08/29/03 to 02/12/04)	SRI	PA DEP
04/01/04	Submit Jan.-Mar. 2004 Quarterly Report	SRI	PA DEP

04/02/04	Water quality monitoring		
04/24/04	Wetland planting conducted with AWARE, BMI, SRI		
04/---/04	Article posted on SRI website		
06/10/04	Water quality monitoring		
06/21/04	Participate in AWARE meeting		
07/12/04	Submit Apr.-Jun. 2004 Quarterly Report	SRI	PA DEP
07/17/04	Wetland planting conducted with AWARE, Beran Env., BMI, SRI		
07/29/04	Water quality monitoring		
08/---/04	Article in *The Catalyst* (Slippery Rock Watershed Coalition)		
10/08/04	Submit Jul.-Sep. 2004 Quarterly Report	SRI	PA DEP
10/18/04	Participate in AWARE meeting		
10/18/04	Water quality monitoring		
01/18/05	3rd Reimbursement request (Period 02/13/04 to 06/30/05)	SRI	PA DEP
02/21/05	Participate in AWARE meeting		
02/21/05	Water quality monitoring		
04/18/05	Participate in AWARE meeting		
04/18/05	Water quality monitoring		
05/19/05	Field Inspection		
06/24/05	Added hay bales to wetland with AWARE, BMI, SRI		
07/18/05	Field Inspection		

PROJECT DESCRIPTION

Introduction

Drainage from extensive now-abandoned coal mining activities has severely impacted the Aultmans Run Watershed. Recognizing the negative impact not only to the environment but also to quality of life, residents, local businesses, and a local university have formed a coalition to implement solutions to this problem. Founded in 2000, the Aultman Watershed Association for Restoring the Environment (AWARE) has been actively involved in the restoration of waterways and groundwaters with the goal of restoring Aultmans Run and its tributaries to a viable fishery.

The 29-square mile Aultmans Run Watershed is located in southern Indiana County, western PA. Aultmans Run, a trout-stocked fishery, flows through six municipalities from the headwaters near the village of Crete to the Conemaugh River Lake. Abandoned mine drainage has been identified as a major contributor to water quality problems. In 1994, the US Army Corps of Engineers and the Pennsylvania Fish and Boat Commission completed the Conemaugh River Lake Management Report, which recommends that fishing should not be promoted in Aultmans Bay as aquatic life production is limited by abandoned mine drainage. In 2001, through PA DEP Growing Greener funding, AWARE, the Environmental Alliance for Senior Involvement (EASI), the Stream Team, Indiana University of Pennsylvania, and Skelly & Loy assessed the characteristics of the most pollutive abandoned mine discharges. [Ref.: Aultman Watershed Assessment]

The watershed has been extensively mined for coal both by surface and underground methods. There are a total of 19 surface mine permits on record in the PA DEP Cambria District Mining Office. [Ref.: Aultman Watershed Assessment] In addition, there were numerous commercial underground mining operations. As much of the coal extraction in the watershed was conducted prior to the development of modern-day, environmentally-considered, mining methods, these now abandoned activities are responsible for on-going degradation to the watershed.

The initial discharge tackled is within the headwaters and is known as the SR 286 Discharge. This iron-bearing, net alkaline drainage is the first major source of impairment to the main stem of Aultmans Run. The abundance of iron precipitating in Aultmans Run has had a substantial impact on the quality of the downstream aquatic habitat. The PA Department of Environmental Protection, Bureau of Mining and Reclamation conducted a rapid bioassessment for a portion of the Aultmans Run Watershed in the summer of 2001. When sampling for aquatic macroinvertebrates downstream of the SR 286 Discharge, the results were low, yielding less taxa than in a physically similar, unimpaired, stream system. Based on DEP studies, however, Aultmans Run has been identified as having the potential to be restored to a high quality habitat. (See Publications section for PA DEP, BMR Draft Report.)

Partnering with AWARE, Stream Restoration Inc. received a grant to design, permit, and construct a passive system to treat the discharge. After a year of permitting efforts,

construction of the system took less than a month, beginning December 16, 2003 and ending January 9, 2004.

Regional Mining History

The town of Aultman, like many other residential areas in the watershed, was established by Rochester and Pittsburgh Coal Company (R&P) to support underground mining operations. Built by R&P between 1912 and the early 1920's, Aultman was a rather progressive community for the time period having their own water system, electric streetlights, company store, community hall, doctor's office, and elementary school. A total of 107, two-story wood frame houses were constructed by R&P for the miners and their families. Because of a local labor shortage, many of the miners were immigrants from Europe, including Italy, Poland, Hungary, Czechoslovakia, Yugoslavia, Russia, Romania, Lithuania, and Austria-Hungary. Electricity was provided by R&P to Aultman at no cost using two, 25-cycle generators from a power plant at Lucerne. The Buffalo, Rochester, and Pittsburgh Railroad, which was also owned by R&P, transported the coal from the mines and brought goods to the company store. Ownership of the railroad enabled R&P to quickly, cheaply, and efficiently, transport coal to Buffalo, Rochester, and other northern markets. In addition, R&P obtained track rights between Indiana and Pittsburgh over the Baltimore and Ohio rail lines, enabling expansion operations south to Pittsburgh's growing iron and steel industries. (See Publications section for more information on the history of Aultman.)

[Ref.: The Village of Aultman by Donald E. Burkett and Brief History of the Rochester and Pittsburgh Coal and Iron Company, http://www.mcintyrepa.com/historyRPCo.htm]

Site Location

The SR 286 Passive Treatment System is located along the southerly side of State Route 286 in Center Township, Indiana County, just outside of the town of Aultman. The site, on private property owned by John Stilley, is on the floodplain of Aultmans Run and beneath overhead transmission lines owned by Edison Mission Energy (EME) from the Homer City Generating Station. The site is on the 7 ½' USGS McIntyre topographic map at latitude 40° 33' 23" and longitude 79° 15' 33". (See Figure 1 – Location Map.)

Site History

The SR 286 Passive Treatment System restoration site is characterized by a discreet discharge associated with a gravity drain from an abandoned underground coal mine. This discharge was conveyed untreated to Aultman Run via an old ditch, about 500 feet in length. Reportedly, the #4 Mine was operated by R&P. Iron precipitated in the ditch and on the substrates of Aultmans Run, providing a very visual stream impact. Based on PennDOT design plans provided by Donald E. Burkett, the construction of State Route 286 is responsible for the current location of the existing ditch and discharge. An 18-inch, triple-strength, vitreous clay pipe was installed by PennDOT to convey the discharge from the north side of State Route 286 beneath the road. Further evidence of mining can be seen to the north of State Route 286 with a large coal refuse pile.

Based on a limited review, neither Works Progress Administration mapping (ca. 1930s) nor Mine Permit Index Maps from the PA Department of Environmental Protection identified the underground mining around Aultman.

Site Preparation

Erosion and Sediment Pollution Controls were installed upon completion of a written plan approved by the Indiana County Conservation District. Controls included a diversion ditch upgradient and silt fence downgradient of the earth disturbance activities. An Environmental Assessment was conducted and submitted and a waiver of permit requirements was received under Pennsylvania Code Title 25, Chapter 105.12(a)(16). (See timeline in Project Summary Section for more details regarding correspondence associated with the restoration waiver.) Passive system design plans were completed by BioMost, Inc. and submitted to the PA DEP, Cambria District Mining Office. PA One Call relating to underground utilities was contacted (Serial #3170853) and a Highway Occupancy Permit was received from PennDOT. The site of the passive treatment system was then cleared and grubbed.

Passive Treatment System Design and Reclamation Effort

The passive treatment system at Fox Run Restoration Area – Phase 1 includes the following components:

1. Existing Collection System
2. Forebay
3. Limestone Rip-Rap Level Spreader
4. Aerobic Wetland planted with native species
5. "Drop" Pool
6. Existing Channel Wetland

Collection System: The passive treatment system utilizes the existing collection system installed by PennDOT. Details of the collection system are not known. A 328-foot long, 18-inch, triple-strength, vitreous clay pipe conveys the discharge from the abandoned underground mine, beneath State Route 286 and to the Forebay. The collection system outlet piping was not disturbed and the pre-existing water level elevation was maintained in order not to impact the hydrologic conditions associated with the discharge.

Forebay: The Forebay captures the SR 286 Discharge that emanates just south of State Route 286. This small component aids in the retention of metal solids. The outlet of the Forebay is a Limestone Rip-Rap Level Spreader.

Limestone Rip-Rap Level Spreader: Consisting of R-4 rip-rap, the level spreader maintains the water elevation in the Forebay at 1078.8± feet and equally distributes the flow into the Aerobic Wetland. A half-foot drop from the Forebay to the precipitation pool aids in aeration and degassing of carbon dioxide. The Level Spreader is ~37 feet in width and ~15 feet in length.

Aerobic Wetland: The effluent from the Forebay and Level Spreader flows into a ~215-foot long by ~125-foot wide rectangular, constructed wetland confined between State Route 286, Aultmans Run, a non-degraded wetland, and an unnamed tributary. Spent mushroom compost provides a ~½-foot thick organic substrate. This **0.6-acre** Aerobic Wetland was designed with microrelief and woody debris to enhance performance relating to both treatment and wildlife value.

After only a few months without any assistance, plants, such as spike rush, cattails, and various grass species, began to colonize the Aerobic Wetland, which was also planted with a variety of native species on three separate occasions with volunteers from AWARE. (See Table I for plant list.) During the plantings, portions of the Aerobic Wetland were reconfigured to increase the amount of treatment area. In addition, live stakes of Black Willow and Silky Dogwood were collected and planted to develop structural diversity and help create shade as part of the wildlife habitat. As the vegetation becomes denser and the substrate becomes more developed, the amount of iron particulates settling within the Aerobic Wetland is projected to increase.

Table I. Plant List

Common Name	**Scientific Name**
Eastern Burreed	*Sparganium americanum*
Soft Rush	*Juncus effuses*
Smartweed	*Polygonum sp.*
Spadderdock	*Nuphar luteum*
Three-way Sedge	*Dulichium arundinaceum*
Rice Cutgrass	*Leersia oryzoides*

The outlet of the wetland is a ~38-foot wide limestone aggregate spillway. The broad spillway discourages channelization of the water leaving the Aerobic Wetland. Hay bales were placed at the spillway inlet to raise the water elevation to encourage uniform flow distribution. The water elevation, currently 1078.2± feet, is dependent upon the condition of the hay bales, vegetation, and debris. The spillway provides ~2 feet of drop aiding in aeration. A "Drop" Pool is located at the spillway outlet.

"Drop" Pool: With a depth of ~2.0 feet, the "Drop" Pool is a small structure used to encourage uniform flow into the Existing Channel Wetland and to allow for settlement and retention of metal particulates. The water elevation in the "Drop" Pool is 1076.1± feet.

Existing Channel Wetland: Utilizing the Existing Channel Wetland provides additional treatment area. This area is especially useful in capturing iron precipitates, as the spillway from the Aerobic Wetland aerates the water. A 6-inch, Schedule 40, PVC pipe has been installed at the outlet to measure flows.

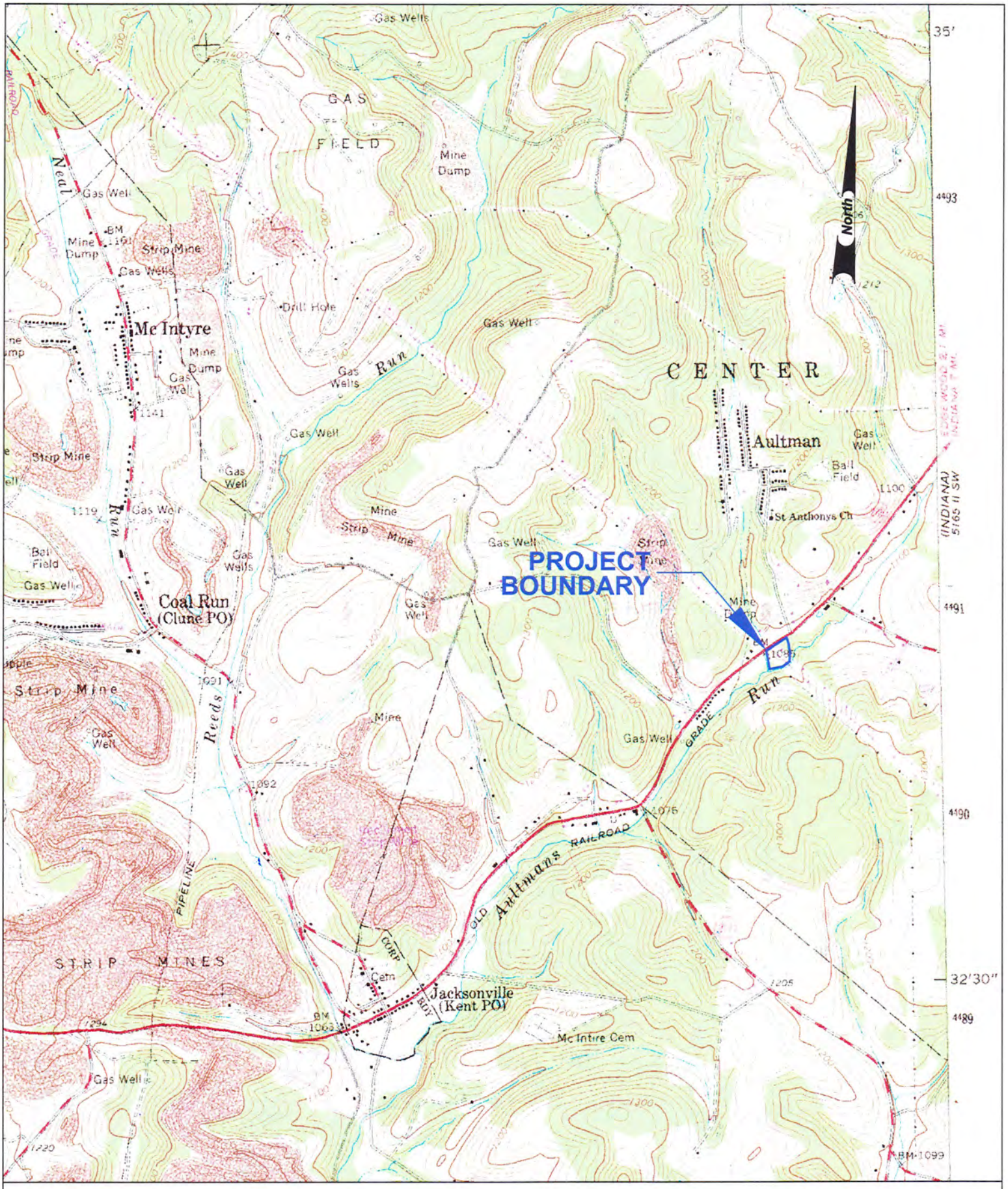


FIGURE 1: LOCATION MAP - USGS 7.5' MCINTYRE, PA (PR1981)

SR 286 PASSIVE TREATMENT SYSTEM

Approximate Center of Project (deg-min-sec)
40-33-23 latitude 79-15-33 longitude

2000 1000 0 2000

Center Township, Indiana County, PA
Stream Restoration Incorporated
June 2005, Scale 1" = 2000'

BioMost, Inc., Mining and Reclamation Services
Cranberry Twp., PA: 85AB/topo

PASSIVE TREATMENT SYSTEM PERFORMANCE

Drainage Treatment

The SR 286 Passive Treatment System on Aultmans Run has been online and functional since January 2004. Project partner BioMost, Inc. has conducted post-construction water monitoring.

As sampling has only been conducted for about 16 months, the results must be regarded as preliminary when considering the design life of the system to be 25 years. Table II identifies the water quality characteristics through selected components from the influent to the effluent.

Table II. Water Quality Through the SR 286 Passive Treatment System

Component	pH (field/lab)	Alkalinity (field/lab)	Acidity	D. Fe	D. Mn
286 Discharge *(Raw)* (n=31)	6.1/6.3	91/68	-20	15	1
Aerobic Wetland (n=6)	6.7/6.8	76/66	-50	6	1
Ex. Channel Wetland (85-16) (*Treated)* (n=6)	7.0/7.0	75/68	-53	4	1

Average values; lab and field pH not averaged from H-ion concentrations; alkalinity, acidity, dissolved metals expressed in mg/L; (See attached sample analyses.)

Overall, the passive system appears to be working well. The raw mine drainage based on available water quality data can be characterized as being net alkaline with significant concentrations of dissolved ferrous iron, low concentrations of manganese, and very low concentrations (typically at or below detection limit) of aluminum. Based on average values, the final effluent which discharges via the Existing Channel Wetland to Aultmans Run is net alkaline (75 mg/L alkalinity and –50 mg/L acidity) with 4 mg/L each of dissolved iron and less than 1 mg/L manganese.

Figures 2-4 illustrate the changes in pH, alkalinity, and dissolved iron as the water flows through the passive treatment system. In general, dissolved iron and alkalinity decrease through the system while pH increases. The alkalinity is consumed as hydrogen ions are released during the formation of iron precipitates. The pH increases throughout the system through the degassing of dissolved carbon dioxide from the mine water.

Based upon a comparison of the average loadings of the raw discharge (post-construction) with the final effluent channel (85-16), approximately 70% or 17 pounds of iron per day are being retained within the passive treatment system.

Function of Individual Components

Forebay: The Forebay serves the purpose of settling iron solids and debris before conveying the water into the Aerobic Wetland. The outlet from the Forebay is a level spreader that appears to at least initially “spread out” the water and discourage short-circuiting in the Aerobic Wetland. As the discharge cascades over the level spreader dissolved carbon dioxide begins to degas and the water becomes oxygenated while iron-bearing solids begin to precipitate. Samples were not collected at the Forebay outlet to evaluate the treatment provided.

Aerobic Wetland: The Aerobic Wetland serves to provide oxidation and precipitation of metals with iron being the primary metal of concern. The wetland is on average oxidizing and retaining about 9 mg/L of dissolved iron, which equates to about 15 pounds per day, accounting for about 60% of the total iron loading.

Final Effluent from Existing Channel Wetland (85-16): The pre-existing constructed channel wetland provides for additional oxidation and precipitation of metals before discharging to Aultmans Run. On average, the channel is retaining an additional 2.5 pounds per day of iron or about 10% of the total loading.

Comparison of pH Values Through the 286 Passive Treatment System Over Time

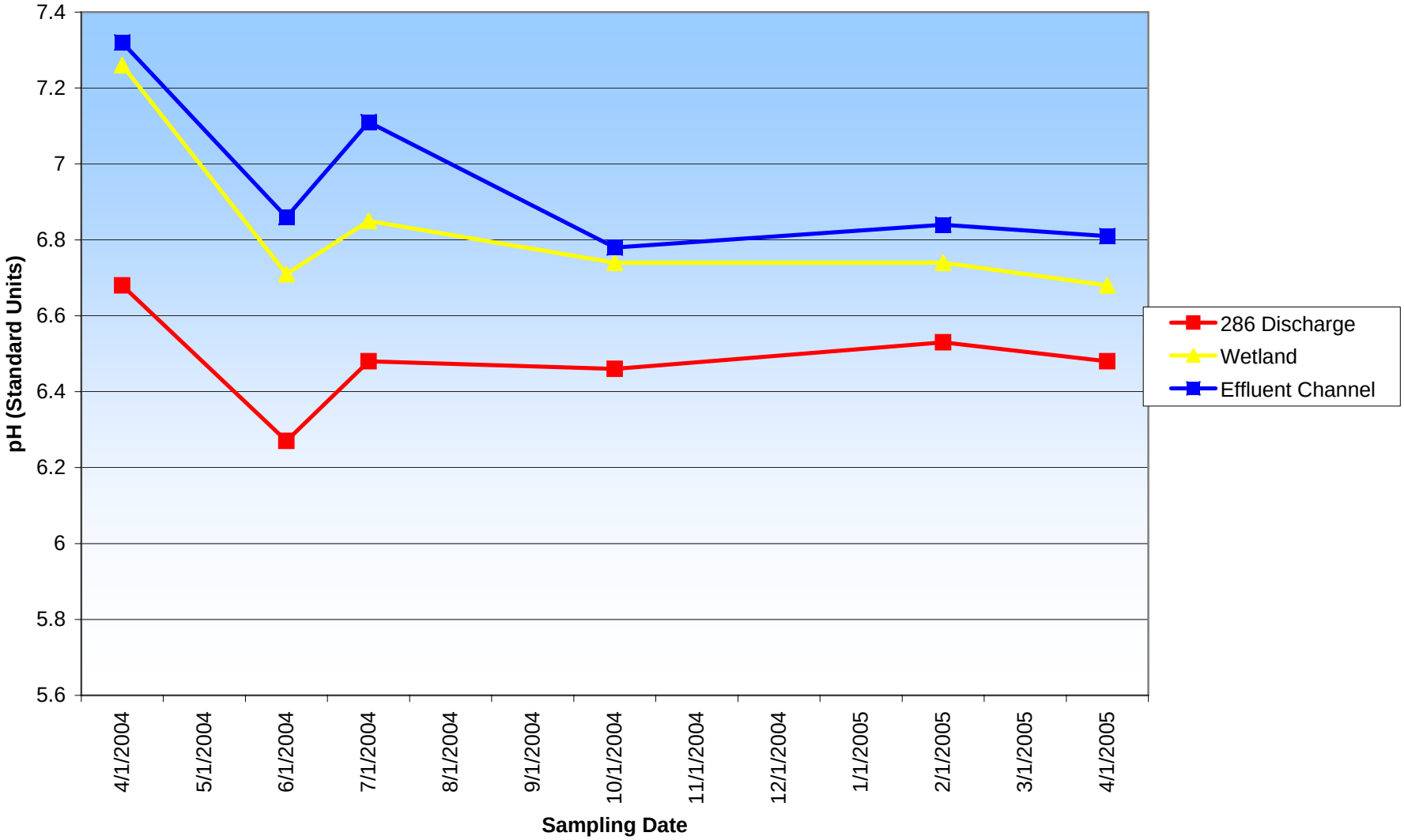


Figure 2.

Comparison of Laboratory Alkalinity Values Through the 286 Passive Treatment System Over Time

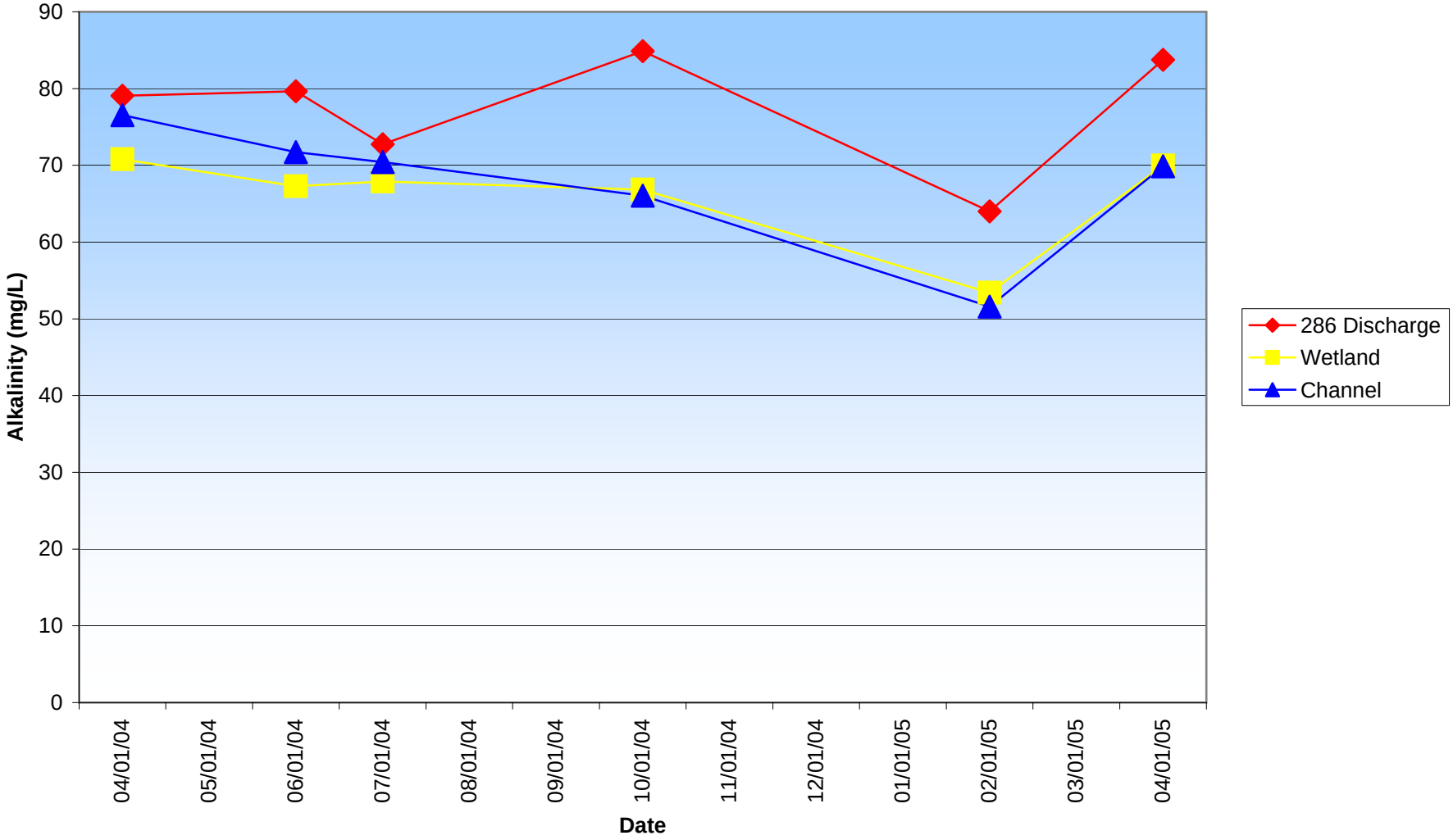


Figure 3.

Comparison of Dissolved Iron Concentrations Through the 286 Passive Treatment System Over Time

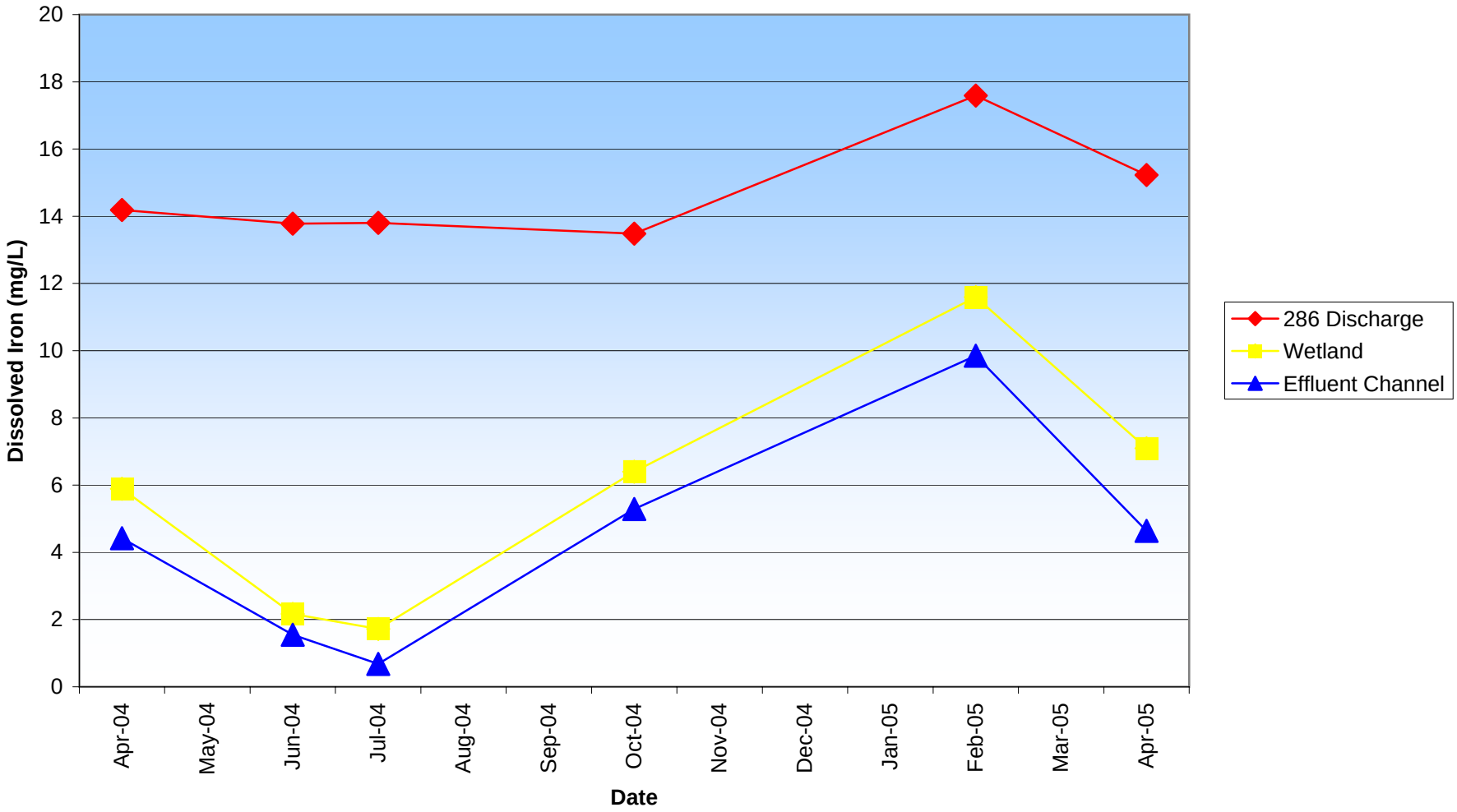


Figure 4.

MEASURABLE ENVIRONMENTAL RESULTS

About 70% of the iron associated with the SR 286 discharge is being retained within the passive treatment system, which equates to 6,300 pounds (3 tons) per year of iron that is no longer entering Aultmans Run.

Impact to Receiving Stream

Prior to construction of the SR 286 Passive Treatment System, the net-alkaline, iron-laden, mine discharge entered Aultmans Run via a constructed channel, which probably provided some treatment as the water became oxygenated and iron precipitated. As can be seen in Figure 5 and Figure 6, the discharge increased both the alkalinity of the stream as well as the total and dissolved iron concentrations. While the additional buffering capacity was a positive impact to the watershed, which receives acidic discharges downstream, the increased iron was detrimental to aquatic life. With a loading of over 25 lbs/day of iron, total iron concentrations within the stream were increased significantly by about 600%.

Table III. Pre-Construction: Aultmans Run Above and Below SR 286 Discharge

Sample Point	pH (field)	Alkalinity	Acidity	T. Fe	D. Fe
Aultmans Run upstream (85-14)	7.2	30	-8	0.4	0.3
Aultmans Run downstream (85-13)	7.1	64	-35	2.8	0.5

Average values; alkalinity, acidity, total and dissolved metals concentrations in mg/L; average pH not calculated from H-ion concentrations; (See attached analyses.)

With the installation of the passive treatment system, 70% of the iron loading was no longer entering Aultmans Run. Total iron concentrations are decreased, on average, by nearly 60% and often more than 80%.

Table IV. Post-Construction: Aultmans Run Above and Below Passive System

Sample Point	pH (field/lab)	Alkalinity (field/lab)	Acidity	T. Fe	D. Fe
Aultmans Run upstream (85-14)	7.1/7.1	40/31	-19	0.4	0.1
Aultmans Run downstream (85-13)	7.0/7.0	42/37	-26	1.2	0.4

Average values; alkalinity, acidity, and total and dissolved metals concentrations in mg/L; average pH not calculated from H-ion concentrations; (See attached analyses.)

The SR 286 Discharge is the first major source of degraded abandoned mine drainage to enter Aultmans Run. Implementation of a passive system at this site is the first phase for continued restoration efforts in the lower reaches of Aultmans Run. The decrease in iron loading to Aultmans Run through the installation of the SR 286 Passive Treatment System substantially improves the aquatic ecosystem, providing habitat suitable for the return of macroinvertebrates and fish to this section of the stream.

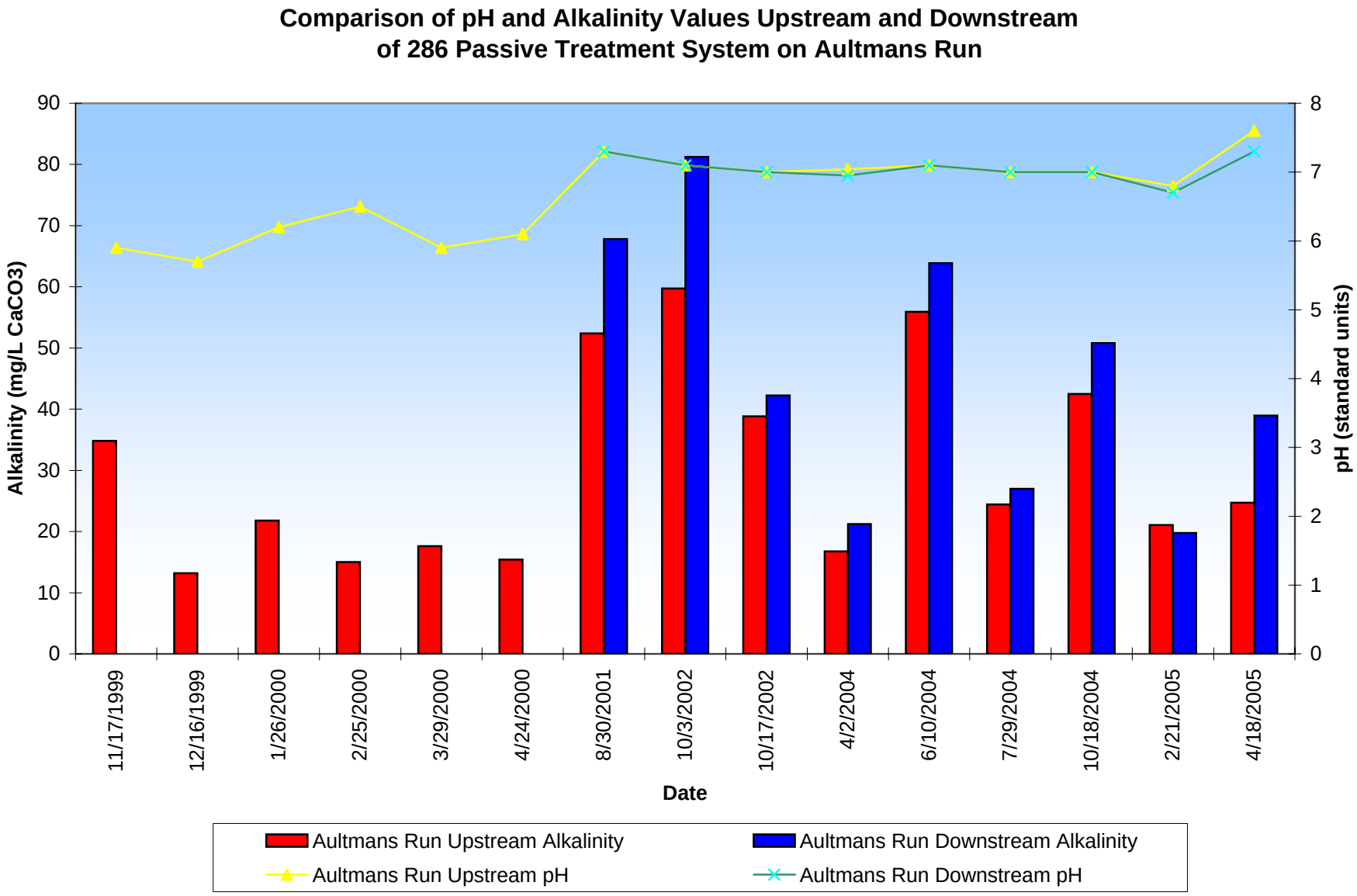

Comparison of pH and Alkalinity Values Upstream and Downstream of 286 Passive Treatment System on Aultmans Run
Alkalinity (mg/L CaCO3)
pH (standard units)
Date
0
10
20
30
40
50
60
70
80
90
0
1
2
3
4
5
6
7
8
11/17/1999
12/16/1999
1/26/2000
2/25/2000
3/29/2000
4/24/2000
8/30/2001
10/3/2002
10/17/2002
4/2/2004
6/10/2004
7/29/2004
10/18/2004
2/21/2005
4/18/2005
Aultmans Run Upstream Alkalinity
Aultmans Run Downstream Alkalinity
Aultmans Run Upstream pH
Aultmans Run Downstream pH

Figure 5.

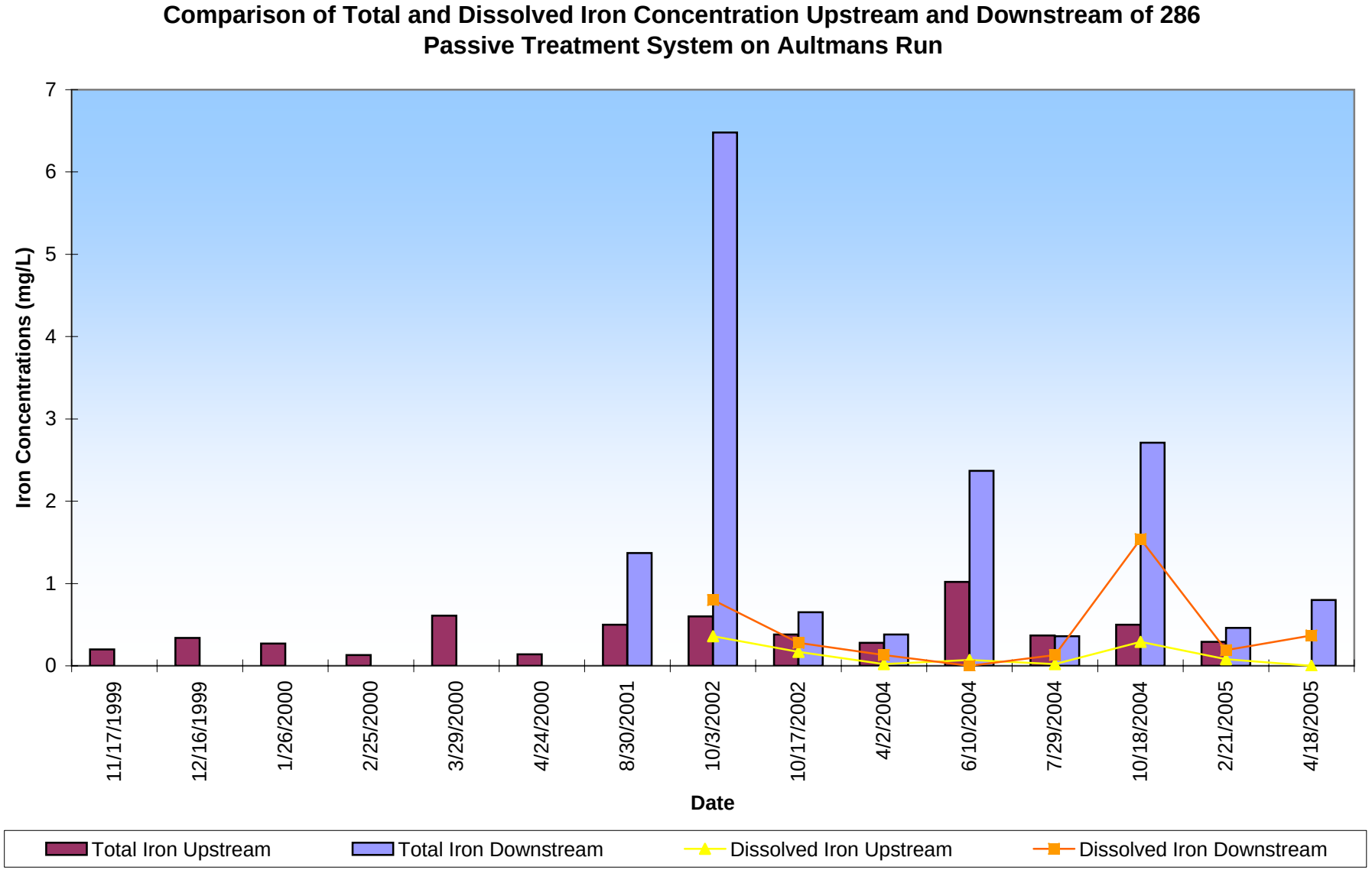

Comparison of Total and Dissolved Iron Concentration Upstream and Downstream of 286 Passive Treatment System on Aultmans Run
Iron Concentrations (mg/L)
0
1
2
3
4
5
6
7
11/17/1999
12/16/1999
1/26/2000
2/25/2000
3/29/2000
4/24/2000
8/30/2001
10/3/2002
10/17/2002
4/2/2004
6/10/2004
7/29/2004
10/18/2004
2/21/2005
4/18/2005
Date
Total Iron Upstream
Total Iron Downstream
Dissolved Iron Upstream
Dissolved Iron Downstream

Figure 6.

Tim Danehy, BioMost, Inc., carefully takes a water sample of the SR286 discharge. Several feet of iron had accumulated within the channel.

A narrow channel conveyed the discharge to Aultmans Run. Wetlands had developed within the channel; however, they were not large enough to treat the discharge.

Scott Alexander, PA DEP, Bureau of Mining and Reclamation, along with several volunteers, conducted a watershed assessment of a portion of the Aultmans Run watershed to determine the impacts of the abandoned mine drainage to the aquatic life within the stream.

Above: Scott takes a conductivity reading of Aultmans Run upstream from where the SR 286 Discharge enters the stream.
Below: Scott collects macroinvertebrates with a kick-net in a lower portion of the watershed.

The discharge created a large iron plume within Aultmans Run impacting aquatic life.

Looking upstream of the SR 286 discharge. During portions of the year, the SR 286 discharge provides the primary flow to the stream.

Bill Altimus, PE, PLS, and Don Burkett discuss the logistics of completing the topographic survey of the project site.

Looking southwesterly at the channel conveying the SR 286 Discharge.

A view of the project site from the top of the coal refuse pile located north of State Route 286. Notice the large, overhead powerlines.

A groundbreaking ceremony was held on 03/21/03 to commemorate the first project to be constructed in the Aultmans Run Watershed.

Below: John Somonick (AWARE), Shaun Busler (Stream Restoration Inc.), Malcolm Crittenden (Project Advisor - PA DEP), Fred Johnson (Amerikohl Mining, Inc.), and Dave Reed (PA Representative)

As part of the groundbreaking activities, the project sign was unveiled.

Bill Altimus, Don Burkett, and Bill Frain show the topographic survey of the site.

A bulldozer and excavator were used to build the passive treatment system (seen in distance).

The forebay shortly after construction. The freshly laid limestone has not yet been coated with iron.

Iron has begun to thickly coat the rip-rap level spreader after only three months of operation.

The wetland outlet flows into a small “drop” pool before entering the existing channel wetland.

Leanne Avery, biology professor at Indiana University of PA (IUP), brought her students to help reconfigure portions of the wetland and plant vegetation.

As part of the wetland planting, woody debris from the surrounding area was gathered and strategically placed throughout the wetland to add habitat diversity and help prevent preferential flow paths.

Students from IUP gather fresh cut live stakes to vegetate the newly constructed wetland.

Michael Poage, geochemistry professor at IUP and board member of AWARE, gather soft rush (*Juncus effusus*) to plant within the constructed wetland.

View of the aerobic wetland standing near State Route 286.

Wetland vegetation that was planted on 4/2/04 and has colonized naturally has begun to grow. The wetland was constructed with microrelief and several deeper pools to enhance the system performance for treatment and wildlife value.

Small toads were found abundantly in both the wetland and surrounding upland areas of the project site.

A second wetland planting occurred on 07/17/04 with Beran Environmental, BioMost, Inc., and numerous volunteers from AWARE. Vegetation was harvested and transplanted to the constructed wetland.

Carl Trout, AWARE member, helps to reconfigure a portion of the wetland and transplant vegetation.

Michael Poage, IUP professor and board member of AWARE, and Shaun Busler, BioMost, Inc., transplant vegetation.

After a long day of work, the hardworking volunteers of AWARE and Beran Environmental staff pose for a photo.
Back row (left to right): Bob Beran with his son Matt Beran (Beran Environmental), Harry Charles (AWARE), Michael Poage (AWARE and IUP), Carl Trout (AWARE), Brian Okey (AWARE and IUP)
Sitting (left to right): Maggie Allio and Carol Cummins

A muskrat has made its home in the wetland. Notice the den in the middle of the wetland.

Malcolm Crittenden, project advisor for the PA Department of Environmental Protection, looks at the riparian area that had been cleared of all vegetation as part of a Federal Emergency Management Agency project.

Hay bales were placed at the outlet of the wetland to encourage more uniform distribution of the mine discharge throughout the wetland.

Rock was placed below the hay bales to help keep them in place. Notice that the water elevation is at the top of the of hay bales (below).

The constructed aerobic wetland on 02/20/04 shortly after construction (left) and on 07/18/05 after 1.5 years.

SR 286 Passive Treatment System

"A Pennsylvania Growing Greener Initiative"

OPERATION AND MAINTENANCE PLAN

June 2005

Center Township, Indiana County, PA

"A Public-Private Partnership Effort"

William Altimus
Amerikohl Mining, Inc.
Aquascape
AWARE
BioMost, Inc
Beran Environmental
Indiana University of PA
PA DEP
PennDOT
John Stilley
Stream Restoration Inc.
Volunteers

OPERATION AND MAINTENANCE PLAN

This is the operation and maintenance plan for the SR 286 Passive Treatment System located in Center Township, Indiana County, Pennsylvania. This project is constructed just south of the town of Aultman between PA State Route 286 and Aultmans Run, a Trout Stocked Fishery. Aultmans Run flows into the Conemaugh River (Warm Water Fishery), which is a tributary to the Kiskiminetas River (Warm Water Fishery). This passive treatment system consists of a forebay with level spreader, which intercepts the discharge from a pre-existing mine water conveyance pipe from an abandoned underground mine, and an aerobic wetland with riprap spillway and "drop" pool. The mine drainage is then returned to a pre-existing channel that is now a wetland, apparently constructed by PennDOT during roadwork on SR0286, for additional settling of solids prior to entering Aultmans Run. A pipe has been set in the outlet of the vegetated channel wetland for monitoring purposes.

The Aultman Watershed Association for Restoring the Environment (AWARE) will be responsible for the maintenance of all structures in order for the passive treatment system to continue to function properly. This AMD treatment system was designed, based on the best available knowledge and technology at the time, and implemented through a public-private partnership effort coordinated by AWARE (PA non-profit) and Stream Restoration Inc. (PA non-profit). It must be recognized that the technology of passively treating AMD is relatively new. All structures were designed focusing on minimal operation and maintenance compared to conventional treatment systems. In order, however, for these facilities to effectively treat the mine drainage, periodic inspections and maintenance are required. Inspection report forms, site plan schematic with monitoring points identified, and a location map are provided in sheet protectors within this report to allow for ease in copying for field use.

CONTENTS

PASSIVE TREATMENT SYSTEM PROJECT OVERVIEW

Passive systems use no electricity, require limited maintenance, and use environmentally-friendly materials for treatment, such as limestone aggregate and spent mushroom compost. These systems provide a cost-effective alternative to the harsh chemicals typically used for conventional treatment of mine drainage. Passive systems can be designed to neutralize acidity and add alkalinity while providing an environment suitable for beneficial chemical reactions and biological activity. Alkalinity encourages the metals dissolved in the mine drainage to form particulates, which are then retained in channels, settling ponds and/or constructed, naturally-functioning, wetlands. In some cases, the mine discharge contains sufficient alkalinity such that no alkalinity-generating processes are needed, which is the case at the SR286 Passive Treatment System.

There are several main types of passive treatment components that can be used, often in series, to treat degraded mine drainage. These components are chosen based upon the drainage characteristics (quality and flow rate), chemical or biological reaction preferred, and available construction space. The following is a brief description of the SR286 Passive Treatment components.

Collection Systems serve to collect, intercept, and/or combine discharges and seeps as well as to convey water. The SR 286 Passive Treatment System was designed and built to utilize the pre-existing mine water conveyance piping installed beneath SR 286. No details about the collection system are known at this time.

Forebays (right) can serve multiple purposes. They can be used to convey water, provide for settling of debris, and allow for oxidation, precipitation, and accumulation of metal solids. There is one forebay at the SR286 Passive Treatment System. The forebay captures the water from the pre-existing mine water conveyance piping. The forebay outlet spillway to the wetland agitates and aerates the drainage to further encourage formation of metal solids.

Wetlands (left) are typically used in passive treatment systems to allow for the oxidation, precipitation, and accumulation of metal solids that occur when alkaline drainage issues from a minesite or after acidic drainage has passed through an alkalinity-generating treatment component. Although many treatment wetlands are angular-shaped shallow ponds with predominantly cattails, the wetlands at this site have been designed, built, and planted to look and function as natural wetlands with high species diversity to provide not only treatment but also wildlife habitat. There is one aerobic wetland at the SR286 Passive Treatment System.

SITE SPECIFIC INSTRUCTIONS

Everyone who will be involved in the operation of the site should have an understanding of, and the ability to perform, basic routine duties, such as site inspections that include evaluating channels, spillways and passive treatment components as well as water sampling and measuring flows.

PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

To maintain the effectiveness of the passive treatment facility, the site should be inspected at regular intervals and after major precipitation events or other natural/manmade occurrences that may affect the performance or integrity of the system. Regular site inspections should be conducted on a quarterly basis for the first two years and at least annually thereafter. A qualified person should perform the inspection and complete the appropriate report(s). (See attached inspection report forms.) The inspector should keep the paper copy of the report in permanent files in chronological order at a designated location. If desired, "Datashed" can be utilized to report and to store data on a GIS-enabled database online via the website www.datashed.org.

The report should include the inspection date, the inspector's name, the organization with which the inspector is affiliated, and the start and end time of the actual inspection. The following sections correspond with the attached Passive Treatment System O&M Inspection Report.

A. Site Vegetation (Uplands and Associated Slopes)

Vegetation (i.e. groundcover) is extremely important to provide wildlife habitat and to prevent erosion. Erosion can carry sediment into streams resulting in turbidity and siltation. Sediment entering the passive components can cause loss of capacity. During inspection, overall condition of the site vegetation should be observed and numerically rated from 0 to 5. If significant areas are barren, describe the action needed as well as the location. Normal husbandry practices (such as fertilizing, seeding, mulching, removing unwanted species, etc.) should be implemented, as necessary, to maintain a stable non-erosive groundcover and viable wildlife habitat on the site.

Rating	Description	Recommended Action
0	Site barren	Revegetate as soon as practicable; temporary seeding, installation of staked straw/haybales, filter fabric, etc. may be necessary until stabilization with permanent approved seed mix
1	Site mostly barren. Only small isolated areas of vegetation present	(Same as for "0" rating)
2	Large area(s) barren	Outline approximate area(s) on Site Schematic; revegetate as described for "0" rating
3	Revegetation spotty; erosion gullies present	Outline approximate area(s) on Site Schematic; on poorly vegetated areas, seed, mulch, apply soil amendments, as necessary; install staked straw/haybales, rip-rap, etc. in gullies to control erosion
4	Successful vegetation >70% groundcover; few, isolated, minor erosion features or areas with <70% groundcover	Identify potential problem areas; note changes on future Inspection Reports
5	Successful vegetation >70% groundcover	No remedial action required

B. Access and Parking Area

A "pull-off" area along SR286 is available for parking. In addition, there is a stabilized, graded area that may be used for activities relating to maintenance, monitoring, and educational/outreach programs. **THE SR 286 PTS SITE IS LOCATED ALONG A BUSY AND DANGEROUS HIGHWAY (SR 286). TAKE EXTREME CARE!!!!**

On the inspection sheet:

- Stabilized, graded area accessible (Yes or No): Is there debris or trash? Are significant erosion gullies present?
- Maintenance required: Do portions need to be stabilized with aggregate? If so, identify area on Site Schematic. Is machinery required to remove debris?

C. "Housekeeping"

The SR 286 Passive Treatment System is located on private property owned by the John Stilley. He has allowed this facility to be constructed on his property in order to help restore Aultmans Run. Please collect any litter you see during your inspection and dispose of it properly. Do not touch anything that you feel may be dangerous (such as, broken glass) or hazardous. Note these items and their location as a comment in the inspection report. Also report if the project or interpretive signs have been damaged by vandalism or other causes.

D. Vandalism

Please record any type of vandalism and evidence of trespassing on the inspection report. Note any damage to the passive treatment system. Also report any damage to the kiosk.

E. Diversion Ditches and Spillways

All diversion ditches and spillways should be inspected and maintained to minimize erosion and insure proper water handling. The channels should be kept free of obstructions that would restrict water flow. Any debris/obstructions should be removed. Vegetation should be removed from spillways if it causing significant water level increase in the component that it drains. If disturbed or eroded areas are present, then these areas should be stabilized as soon as possible with riprap or noninvasive plant species, as appropriate. Channels or ditches that carry mine drainage should be cleaned when precipitate reduces the capacity by one half.

Hay bales were placed in front of the spillway to raise the water elevation of the wetland to encourage uniform flow distribution throughout the wetland. The water elevation of the wetland is dependent upon condition of the hay bales.

On the inspection sheet, for each identified channel or spillway note:

- Significant erosion present (Yes or No): Is the riprap or vegetative lining impaired or absent? Has the berm been overtopped and/or breached? Is there significant sedimentation as a result of erosion?
- Significant debris present (Yes or No): Are there tree limbs, leaves, trash, etc. that would "dam" the water in the diversion ditches and collection channels? Are there

vegetation and/or debris in the riprap-lined spillways that would cause the water level to rise in the passive components?

- Maintenance performed: Have the plants been removed from the riprap-lined spillways? (Removal of plants from riprap-lined spillways on a regular basis as part of "general housekeeping" prevents overtopping of berms and loss of function of the facility.) Have tree limbs, leaves, trash, etc. been removed? Has the erosion been addressed (rocks placed in erosion features; sediment cleaned from ditches, dirt placed and compacted on berms of ditches and channels, etc.)?
- Maintenance remaining: Describe additional maintenance needed. Indicate areas for additional maintenance on the Site Schematic.

F. Passive Treatment System Components

All passive treatment components need to be inspected for erosion, berm (slope) stability, vegetation, siltation, leaks, etc. Any problem should be noted and corrected as soon as practicable.

During site monitoring, the area of the pre-existing mine water conveyance pipe should be inspected. Normally, the pipe is covered with iron precipitate and not visible. If, however, the flow rate is observed to be substantially decreased or no flow is present, board members of AWARE should be contacted immediately.

Also during site inspection, the condition of the vegetation and the presence of any disturbed or eroded areas should be noted. Significantly disturbed or eroded areas should be stabilized as soon as possible with staked straw/haybales, riprap, plantings with accepted species, etc., whichever is appropriate. For instance, if erosion of the lower wetland berm occurs from flooding of Aultmans Run, it may be necessary to place riprap along the bank for stabilization.

On the inspection sheet, for each identified passive treatment component note:

- Significant erosion present (Yes or No): Are erosion gullies on the inside and/or outside of the berms?
- Features relating to berm instability present (Yes or No): Is there any slumping noted? Are tension cracks visible?
- Successful vegetation (Yes or No): Are there significant areas on the inside and/or outside berms that need to be revegetated? Overall, does the vegetation appear healthy?
- Significant siltation/sedimentation present (Yes or No): Is there significant sediment from erosion of berms or upland areas accumulating in the passive component?
- Significant change in water level (Yes or No): Is the water level rising or lowering in the passive component? Is the water level appropriate (not too high or too low) for the plants in the wetlands?
- Maintenance required: Do portions of the berms need to be stabilized with riprap and/or reconstructed? Does supplemental reseeding and mulching need to be completed? Do any passive components need to be cleaned of sediment? Has there been vandalism to the project sign? Does the 6-inch, SCH40, PVC pipe installed at the end of the pre-existing vegetated channel wetland for monitoring purposes need to be cleaned, repaired, or replaced?

G. Wildlife Utilization

One of the functions of a constructed wetland is to provide wildlife habitat for desired species. If, however, during inspections, signs of damage are noted, such as from muskrats, appropriate steps should be taken to continue the function of the passive system and general site restoration. Significant damage needs to be corrected by repairing berms, removing invasive species, replanting, and trapping (contact PA Game Commission).

On the inspection sheet:

- Animals observed: Although not an inventory, please record whether there were tracks or visual observations of wildlife utilizing the site. Describe any damage observed.
- Invasive plants observed: If invasive or undesirable plants are observed, please note and remove as soon as practicable.

H. Flow Measurements:

Flow rate can be measured at the 6", Sch 40, PVC pipe installed for this purpose at the outlet of the pre-existing channel wetland.

Bucket and Stopwatch

Flow measurements from pipes can be easily made using a bucket and stopwatch. The bucket and stopwatch method consists of timing (in seconds) the filling of a bucket of known volume (preferably calibrated in gallons). The flow rate in gallons per minute can then be calculated utilizing the following formula:

$$\text{Flow (gal/min)} = \left(\frac{\text{Gallons}}{\text{Seconds}} \right) \text{X} \quad 60$$

A large bucket (15- to 20-gallon capacity) may be calibrated and used for flow measurements. To calibrate a bucket, use another container of known volume to add metered amounts of water (i.e., 1-gallon increments). Mark on the bucket with a permanent marker, desired volume gradations. For example, on a 20-gallon bucket, gradations might be at 5, 10, 12, 15, 16,17,18, 19, and 20 gallons although any gradation scheme is acceptable as long as relatively accurate measurements can be made. Due to the awkwardness and weight of a filled 15- to 20-container, using a 5-gallon container may be more suitable. With a measured maximum flow of 200 gpm, however, a 5-gallon container would be filled quickly (1.5 seconds).

I. Water Monitoring and Sample Collection

In order to assess the efficiency and performance of this system and the impact to Aultmans Run, field tests should be completed including pH, temperature, alkalinity, and dissolved iron. Water samples, to confirm field analyses, may also be taken and analyzed by the PA State Lab or other approved laboratory using standard chemical testing procedures for pH, alkalinity, acidity, total iron, dissolved iron, sulfates, and total suspended solids. Field testing is recommended to be completed quarterly or biannually, with confirming lab tests conducted when possible.

Water sampling and field testing at the following locations will enable evaluation of the degree of success of the passive components, individually and combined, in treating the mine drainage:

1. **Raw (in forebay near existing mine drainage conveyance pipe)**
2. **Wetland (in outlet spillway)**
3. **85-16 (final effluent in existing vegetated channel wetland)**
4. **85-14 (Aultmans Run Upstream)**
5. **85-13 (Aultmans Run Downstream)**

The monitoring program should include points other than the final effluent from the wetland in order to provide a complete description of the water quality through the passive treatment system at the time of sampling. For instance, the untreated raw mine discharge (as close to the source as possible), components (at the effluent), and the stream (above and below the system) should be monitored. These monitoring point locations are identified on the O&M Inspection Sheet, site schematic, and "As-Built" plans.

In order to conduct laboratory analyses for pH, alkalinity, acidity, sulfates, and total suspended solids, a 500-ml (or other specified volume), unfiltered, sample should be collected, stored in a cooler, and transported to the laboratory. In order to differentiate between dissolved and total iron concentrations, the laboratory requires two, 125-ml (or other specified volume) samples that are preserved with trace metal-grade nitric acid to ensure that the pH is <2. The sample for total iron is not filtered. The sample for dissolved iron is filtered using a 0.45-μm filter in the field prior to placing the sample in the bottle. The filtering device should be rinsed with distilled or de-ionized water between each sample. Each bottle should be labeled with a unique number.

A record of every sample taken should be made directly on the inspection sheet. Information such as sampler's name, sample location, sample date, flow rate, field tests, and sample bottle identification is written on the inspection sheet. Pertinent information is then transferred from the inspection sheets to the laboratory's Record of Sample form or Chain of Custody form.

On the inspection sheet for each Sampling Point:

- Monitoring point field measurements recorded:

Parameter	**Method**
Flow	Bucket & Stopwatch (where pipe discharge), etc.
pH	HACH pH kit, pH meter, etc.
Temperature	Field thermometer, pH meter, etc.
Total Alkalinity	HACH Digital Titrator, etc.
Iron	HACH iron kit, etc.
Dissolved oxygen (optional)	HACH DO kit, DO meter, etc.

  Record readings to nearest whole number, except pH (record to nearest tenth).
- Sample bottle data: If water samples are collected, assign and record bottle numbers on the inspection sheet. You will need to transfer this information to the laboratory's Record of Sample or Chain of Custody form.
- Comments: Observations such as color of the sample or other information may be recorded in the "Comments" column.

J. SLUDGE ACCUMULATION

During the periodic O&M inspection, it is recommended that a Sludge Accumulation inspection be completed every year or every other year. The primary purpose of this inspection is to assess the type and amount of sludge that is accumulating within the passive treatment components. This can give an indication as to how the system is functioning and when action is needed to remove the sludge from the component.

On the inspection sheet for each component listed provide:

- Sludge Accumulation: Note the depth (estimated) of the sludge. Has the sludge filled the component to within about 1-2' of the primary spillway or top of berm in the Wetland?
- Sludge Description: Note the color of the sludge. Typically, white, red, and black colors indicate precipitate rich in aluminum, iron, and black, respectively.
- Comments: For example: Is there significant organic debris in the sludge?

K. SCHEMATIC

A site schematic has been provided to orient the inspector to the site and is keyed to the various sections of the inspection report. The schematic can also be used to identify specific locations where maintenance is needed, particularly for locations within the site that do not already have a specific identified name and location. For instance, if a section of the site was not well vegetated and experiencing erosion, that area could be circled on the schematic and then a copy or fax could be provided to the person(s) responsible for addressing the issue.

MISCELLANEOUS MAINTENANCE CONSIDERATIONS

All materials used in repairs should be of equal or better quality and have the same capacity and function as shown on the "As-Built" plans.

Removal and disposal of accumulated precipitate or sediment

Precipitates from chemical reactions and other solids will be retained within the forebay and wetlands. This sludge should be removed when the volume of the component is reduced by one half. Inlet and outlets should be kept clear of debris and obstructions. Sludge removal is planned for every fifteen years or as desired. Opportunities may be available to utilize the sludge for metal recovery or the sludge may be allowed to drain/dewater for disposal. At this time, the sludge from coal mine drainage does not require special permitting for disposal. Care, however, should be taken in order not to cause sediment problems in streams. (An Erosion and Sediment Pollution Control Plan should be completed for the placement area.)

WETLAND PLANT DIVERSITY REPORT

It is also recommended that a Wetland Plant Diversity Report be completed at least once per year. The primary purpose of this report is to assess the diversity of plant species within the constructed treatment wetland in order to determine if species diversity is increasing or decreasing. Species diversity is believed to optimize the health, productivity, and treatment capability of the wetland. In addition, increased plant species diversity should result in an increase in wildlife diversity. A secondary purpose is to identify if unwanted invasive plants have become established, such as common reed (*Phragmites australis*) and purple loosestrife

(*Lythrum salicaria*). (See pictures below.) These plants should be removed from the wetlands. On the report provide the common name and/or scientific name for each plant, the plot number, the location of the plot, and the population within that plot.

Common Reed

Purple Loosestrife

REPLACEMENT

All passive treatment systems are unique. The sludge storage capacity for a projected design life of 25 years was based upon background monitoring data and published references. Higher flow rates and poorer water quality can substantially affect the design life. When the storage capacity of the system has been diminished by approximately one half, the sludge should be removed. Prior to removal, the system and water quality should be evaluated to determine if reconstruction of the system is necessary. Advances in technology and changes in raw drainage quality and quantity should be considered to determine if revisions to the size and/or design of the system would be advantageous. Replacement considerations include:

(1) Estimating Best Management Practice (BMP) design life;
(2) Determining replacement responsibility, including a successor, as necessary;
(3) Determining approximate costs for removing accumulated sediments, replacing water control structures, re-sizing the system to accommodate changed water quality or quantity, and replanting wetlands.

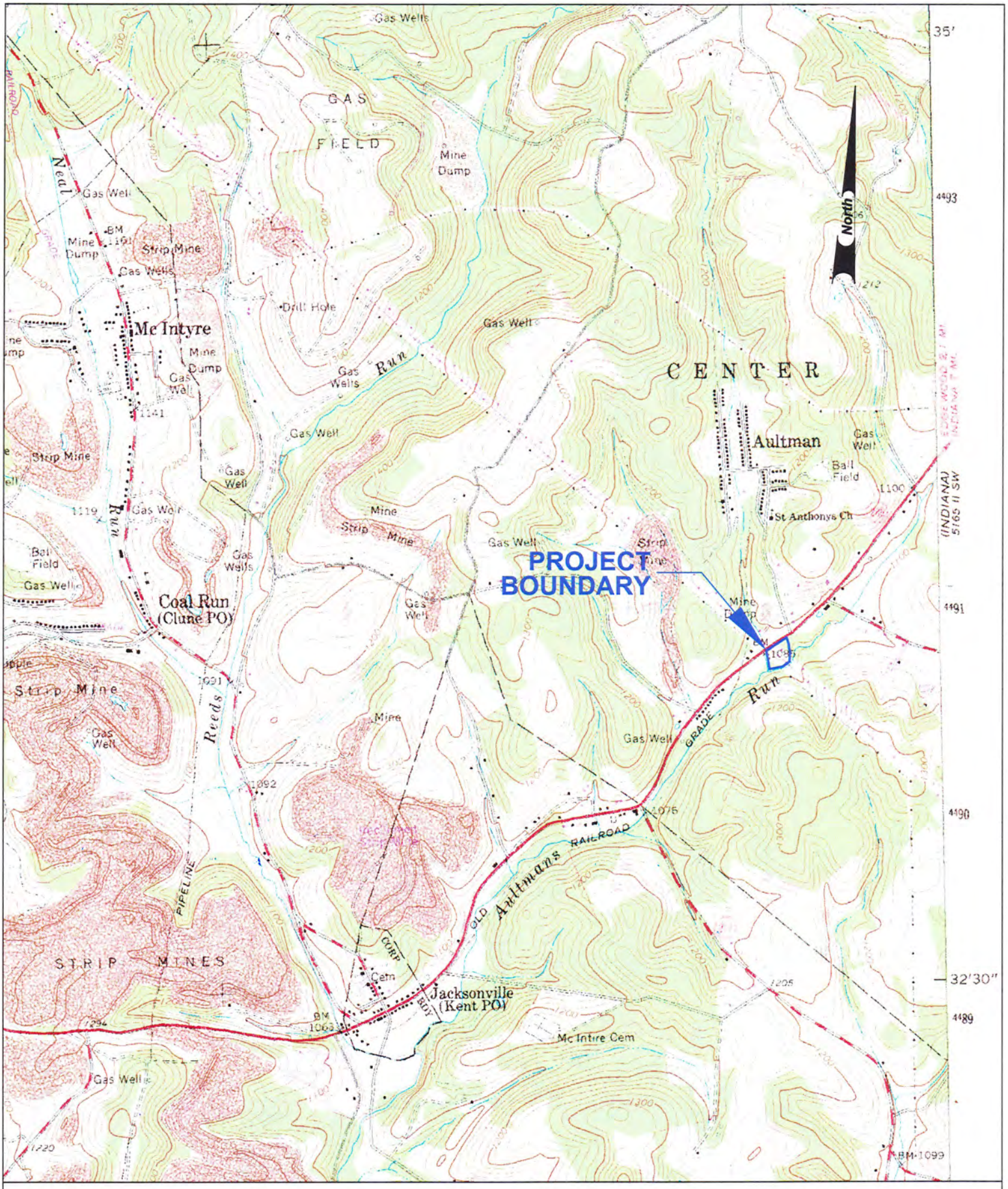


FIGURE 1: LOCATION MAP - USGS 7.5' MCINTYRE, PA (PR1981)

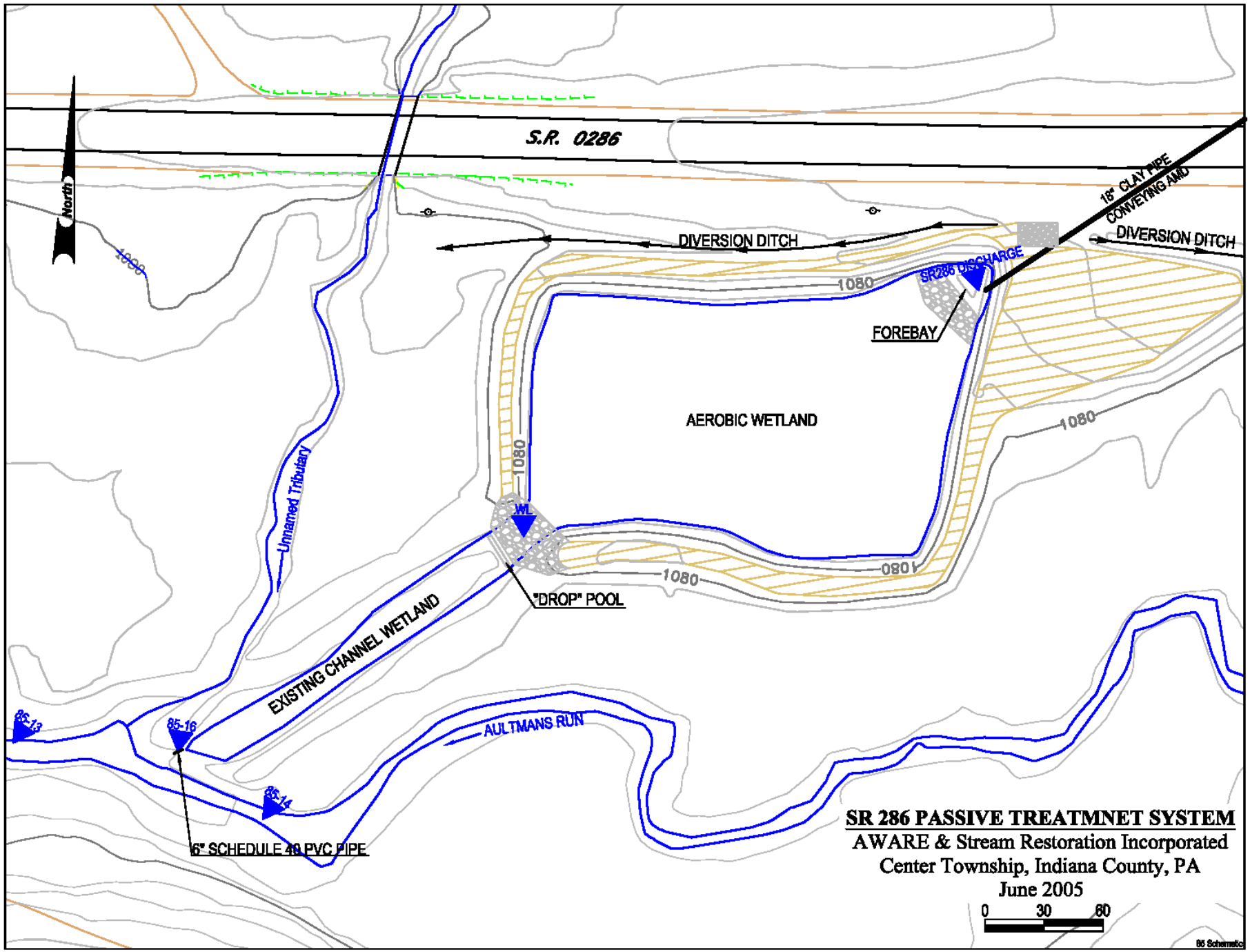
SR 286 PASSIVE TREATMENT SYSTEM

Approximate Center of Project (deg-min-sec)
40-33-23 latitude 79-15-33 longitude

2000 1000 0 2000

Center Township, Indiana County, PA
Stream Restoration Incorporated
June 2005, Scale 1" = 2000'

BioMost, Inc., Mining and Reclamation Services
Cranberry Twp., PA: 85AB/topo


S.R. 0286
North
1080
DIVERSION DITCH
18" CLAY PIPE CONVEYING AMD
DIVERSION DITCH
SR286 DISCHARGE
FOREBAY
AEROBIC WETLAND
1080
1080
1080
1080
WL
Unnamed Tributary
"DROP" POOL
EXISTING CHANNEL WETLAND
AULTMANS RUN
85-13
85-16
85-14
6" SCHEDULE 40 PVC PIPE
SR 286 PASSIVE TREATMNET SYSTEM
AWARE & Stream Restoration Incorporated
Center Township, Indiana County, PA
June 2005
0
30
60
86 Schematic

PASSIVE TREATMENT SYSTEM O&M INSPECTION REPORT

6/2005

Inspection Date:		Project Name:	SR 286 Passive Treatment System
Inspected by:		Municipality:	Center Township
Organization:		County:	Indiana State: PA
Time Start:	End:	Project Coordinates:	40° 33' 23" Lat 79° 15' 33" Long
Receiving Stream:	Aultmans Run	Subwatershed:	Conemaugh River Watershed: Kiskiminetas River

Weather (circle one): Snow Heavy Rain Rain Light Rain Overcast Fair/Sunny Temp(°F): ≤32 33-40 41-50 51-60 60+

Is maintenance required? Yes/No If yes, provide explanation: _____

_____

_____

INSPECTION SUMMARY

A. Site Vegetation (Uplands and Associated Slopes)

Overall condition of vegetation on site: 0 1 2 3 4 5 (0=poor, 5=excellent, circle one) (See instructions.)

Is any reseeding required? Yes/No If yes, describe area size and identify location on Site Schematic:

B. Access and Parking Area

Is the access road accessible for operation and monitoring? Yes ☐ No ☐
Does the access need maintenance? Yes ☐ No ☐
Describe maintenance performed and remaining (Identify location on Site Schematic.): _____

_____

_____

C. "Housekeeping"

Is there litter along the road? Yes ☐ No ☐ Is there litter around or in the passive system? Yes ☐ No ☐
Is there litter that may be considered hazardous or dangerous that requires special disposal? Yes ☐ No ☐
Additional comments: _____

D. Vandalism

Is there any defacing or damage to signs? Yes ☐ No ☐ Is the pipe for measuring flows at existing wetland outlet still there? Yes ☐ No ☐
Additional comments: _____

E. Diversion Ditch and Spillways

Channel Identification	Significant Erosion (Y/N)	Debris Present (Y/N)	Maintenance Performed (Y/N)	Maintenance Performed and Remaining (Indicate ditch by number i.e. 2b = Settling Pond Outlet)
1. Upland Diversion Ditch				
2. Rock-Lined Spillways				
a. Level Spreader (Forebay Outlet)				
b. Wetland Outlet				
3. Existing Wetland				

F. Passive Treatment System Components

Component	Significant Erosion (Y/N)	Berms Stable (Y/N)	Vegetation Successful (Y/N)	Siltation Significant (Y/N)	Water Level Change (Y/N)	Maintenance Performed and Remaining (Indicate which component i.e. Settling Pond)
Forebay						
Wetland						
Ex. Wetland						

G. Wildlife Utilization

Animal sighted or tracks observed: _____
Invasive plants observed:_____
Describe any damage caused to treatment system by wildlife (especially muskrats) and required maintenance: _____
_____

H. & I. Flow Measurement, Field Water Monitoring, and Sample Collection - ☐ - Not monitored

Raw water sample locations as marked on plan.
For passive components sample effluent.

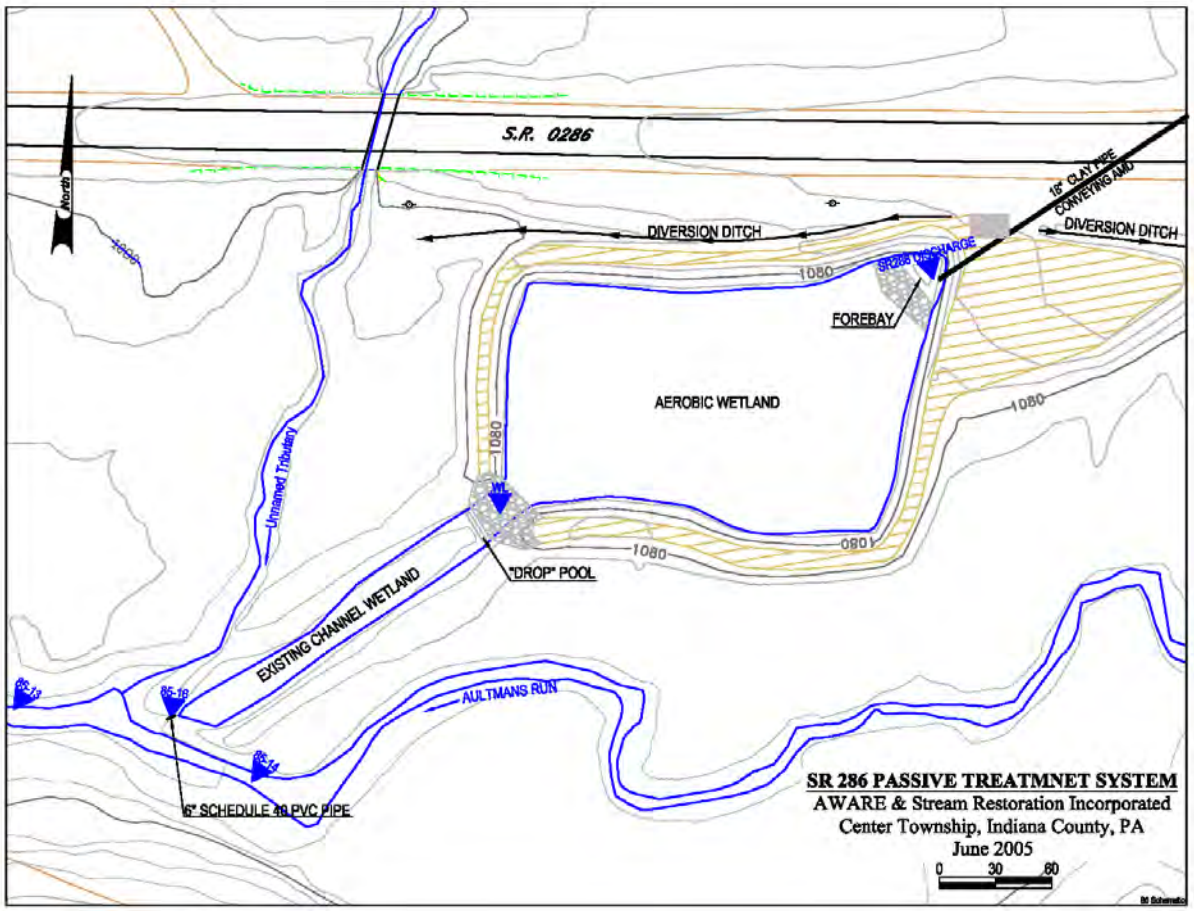
Sampling Point	Flow Measurements		Calculated Flow (gpm)	pH	Temp (°C)	Alkalinity (mg/L)	DO (mg/L)	Iron (mg/L)	Comments	Bottle #	Bottle # (total metals)	Bottle # (diss. metals)
	gals	sec.										
286 Discharge												
Wetland (outlet)												
85-16 (final effluent)												
85-14 (upstream)												
85-13 (downstream)												

J. Sludge Accumulation
☐ - Not monitored

Component	Sludge Accumulation		Sludge Description	Comments
	Depth (ft)	(within 1-2' - Y/N*)		
Forebay				
Wetland*				
Existing Wetland				

*Note: The sludge accumulation in the Wetland may exceed the crest of the spillway as vegetation continues to grow in accumulated precipitates and helps to stabilize the sludge. In this case the sludge may continue to accumulate to within about 2' of the total berm height.

K.



WETLAND PLANT DIVERSITY REPORT

Inspection Date:	____________	Project Name:	**SR286 Passive Treatment System**
Inspected by:	____________	Municipality:	**Center Township**
Organization:	____________	County:	**Indiana** State: **PA**
Time Start: ______	End: ______	Project Coordinates:	**40° 33' 23"** Lat **79° 15' 33"** Long
Receiving Stream:	**Aultmans Run**	Subwatershed:	**Conemaugh River** Watershed: **Kiskiminetas River**

Weather (circle one): Snow Heavy Rain Rain Light Rain Overcast Fair/Sunny **Temp(°F):** #32 33-40 41-50 51-60 60+

Wetland: ____

Common Name	Scientific Name	Plot #	Plot Location	Number

Wetlands Project Funded

March 23, 2003

AULTMAN - Plans for a major watershed restoration project were unveiled Friday along Route 286 near Aultman in Center Township.

Stream Restoration, Inc. of Cranberry, a non-profit group, received a $93,000 Growing Greener grant to build a quarter-acre wetlands treatment site to remediate pollution flowing under Route 286. Additional money is being provided by the Western Pennsylvania Watershed Protection Program.

In the system that will affect about five acres, iron solids will settle out of water coming from a bore hole that drains abandoned underground mines nearby. The treated water will then flow into Aultmans Run.

Construction of the wetland will start soon and be completed this fall.

Members of the Aultman Watershed Association for Restoring the Environment (AWARE) are assisting with the project.

Stream Restoration's mission focuses on the restoration of streams impacted by abandoned coal mine drainage. By developing public-private partnerships involving industry, government agencies, academia and citizen grassroots organizations, projects can be implemented quickly and efficiently.

- Randy Wells

http://www.zwire.com/site/news.cfm?newsid=7468924&BRD=1078&PAG=461&dept_id=151025&rfi=8

Wetlands Project Funded

March 23, 2003

A ceremony to break ground for the wetlands treatment site along Route 286 in Aultman was held Friday.

(Gazette photo by Jamie Isenberg)

Attending were Brian Okey, president of the Aultman Watershed Association for Restoring the Environment, left; John Somonick, AWARE founder; area residents; representatives from the Department of Environmental Protection, BioMoist Inc., Aquascape and Amerikohl Mining Inc.; and Indiana County Commissioners Bernie Smith and Bill Shane.

http://www.zwire.com/site/news.cfm?newsid=7468917&BRD=1078&PAG=461&dept_id=151025&rfi=8

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Wetlands Project Funded

March 23, 2003

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A ceremony to break ground for the wetlands treatment site along Route 286 in Aultman was held Friday.

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FAIRSVILLE DISPATCH

Cleanup efforts focused on Aultman Run

By Jeff Himler
Staff writer
Friday, March 28, 2003

AULTMAN - Beginning this summer, the upper reaches of southwestern Indiana County's Aultman Run should be a little less colorful.

Members of the Aultman Watershed Association for Restoring the Environment (AWARE) and various partner organizations last week broke ground for a passive wetland system intended to cleanse the stream of orange-colored, iron-laden mine drainage along Rt. 286 near the Center Township village of Aultman.

Project participants hope reducing the iron will make more areas of the stream hospitable for trout and other freshwater fish.

John Somonick, a founding member of AWARE, noted the watershed group has stocked various sections of the stream each of the past three springs with about 250 trout raised at the local B[illegible]eggs Nursery. The stream ultimately empties into the Conemaugh River near the village of Lewisville in Conemaugh Township.

"We usually put them in the last week of April," Somonick said of the trout, noting the group expects to repeat the stocking schedule this year.

Heavier water flows in the spring help dilute the iron content and temporarily make the stream more fish-friendly.

According to Somonick, treatment of the drainage from an abandoned Aultman mine will go a long way toward the group's goal of improving the water enough to serve as an ongoing habitat for the fish.

"We want to get rid of the sulphur water," said Bill Frain, an AWARE board member and fire police captain with the Aultman Fire Department.

In addition, AWARE Vice President Paul Calvetti hopes to be able to stock Coon Hollow, a section of the stream which is easily accessible from Aultman Run Road downstream from the village of Kent (or Jacksonville) in Blacklick Township.

AWARE's project is "going to restore a mile or more of stream," said Shaun Busler, a biologist with Stream Restoration Inc. (SRI)--a non-profit organization in Cranberry Township which is helping to design the half-acre wetland.

While trout currently are stocked upstream from the mine

Photo Gallery

click to enlarge

Aerial survey map

click to enlarge

Mine drainage site along Route 286

click to enlarge

Iron pollution turns water orange

Tools

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discharge site, he indicated the passive treatment system should allow the fish to swim further downstream.

Busler explained iron particles in the water can clog the gills of fish a ther aquatic species. He said, "Eventually they're going to suffocate...or move downstream to an area where they can survive."

Also, he noted, reducing iron levels should help boost the stream's population of macroinvertebrates--small, spineless water-dwelling or-ganisms which are large enough to see with the naked eye and which provide an important food source for larger aquatic life.

"They are an indicator of the health of the stream," Busler said, noting, "Certain species are more tolerant of pollution than others."

Busler pointed out mayflies, a favorite menu item for trout and other game fish, are " at the beginning of the food chain." But, "They're very sensitive to pollution. They weren't found downstream from the discharge."

A public-private partnership of several other firms and organizations is assisting AWARE with the mine drainage project.

Helping SRI design the wetland system are BioMost Inc., an environmental consulting company which shares the same office, and Aquascape Wetland and Environmental Services of Grove City.

Amerikohl Mining, which owns the land and coal reserves surrounding the proposed wetland site, provided initial data regarding the location.

T mining firm, which has offices in Butler and Acme, also will bring in earth-moving eq ment to construct the wetland.

Then SRI, Aquascape and local volunteers will seed the wetland with plants which promote precipitation of iron out of the water as it flows through the treatment area.

"It's not just cattails," Busler said of the plantings. "We'll put in a diversity of native plants. It provides some wildlife habitat," while also causing iron particles to "drop out" and remain in the wetland as the mine drainage water continues on in a cleaner state.

Funding for the project comes from a state Growing Greener grant of $100,000 and additional money obtained through the Western Pennsylvania Watershed Protection Program.

In addition, Amerikohl is contributing about $89,000 worth of services in the wetland's construction. The firm also donated funding for an initial conceptual design of the project.

Busler indicated planners have yet to decide how the wetlands area may be divided into smaller ponds, or cells, to regulate the flow of water.

Elements that will be incorporated are an earthen berm surrounding the wetland and a spillway of limestone rip rap to "polish" the water as it is discharged into the stream.

Busler explained, if acidic water was draining from the mine, additional limestone would be used in the wetland to boost alkaline levels.

Be use the mine drainage already has an alkaline chemistry, "It's severity is not as great," s Busler.

At a half acre, the Aultman Run wetland won't be one of the larger treatment systems SRI has helped design. But Busler noted, it still will be of significant importance to local water quality and aquatic life.

"It has an effect on the stream," Busler noted of the mine drainage. "At some times of the year, it makes up the majority of the flow to the Aultman Run."

Bu[illegible]r pointed out the mine discharge releases a maximum of about 200 gallons of co[illegible]ninated fluid into the stream each minute.

Included in the fluid is is an iron concentration of 20 milligrams per liter. That translates into 11,000 pounds of iron each year.

According to Joe Allison, watershed manager with the state Department of Environmental Protection, that's 20 times the level of iron (just 1 milligram per liter) which state standards indicate provide suitable water quality for aquatic life.

The first mine discharge AWARE has tackled, the Aultman site was chosen both for its impact on the stream and its high visibility along Rt. 286.

According to AWARE members, the Aultman drainage originates in an abandoned underground mine which lies beneath a hill situated between the discharge site and the town of Aultman.

Local residents and AWARE members Calvetti and Don Burkett recalled that the Rochester & Pittsburgh Coal Co. dug three shafts into the hillside near Aultman between 1912 and 1928.

In the aftermath of that mining spurt, Calvetti indicated, drainage from the mine initially seeped out in an area along the north berm of Rt. 286, across the highway from the current discharge area.

At about the time the modern highway was constructed, in 1942, the drainage site shifted across the road to a man-made trench which empties into Aultman Run.

A[illegible]se now sits where the drainage used to flow, Calvetti indicated.

Indiana County Commissioners Bernie Smith and Bill Shane were among officials who attended last week's ground-breaking ceremony.

Smith noted the project is "close to my heart," since he grew up in the area.

He recalled an earlier era when protecting the environment and disposing of waste responsibly were not high priorities.

"This was so polluted," he said of the stream. "If there was anything you wanted to get rid of, you just dumped it."

He said he's now happy to be part of a team of officials and citizens that is working to clean up rural waterways and communities.

Calvetti noted he, too, grew up in the area when Aultman Run was contaminated by the activities of both the mine and the local residents. "People had open outside toilets and the sewage went into the stream," he recalled.

While water and power for the community initially were provided by the mining company, today's modern water and sewage systems are operated by the Indiana County Municipal Services Authority.

Reflecting on the AWARE project, Shane said, "Our mission in life is to leave the world a little b[illegible] than we found it, and that's what we're doing."

Busler noted steps under way in the project include completing a survey to pinpoint the exact location and elevation of the mine discharge.

He explained those figures will be important in designing a wetland system which regulates

water flow properly.

Also, Busler said, project officials are working on an erosion and sedimentation control plan for the project.

SRI President Margaret Dunn indicated the Aultman project will add to 5,000 acres of wetlands and 500 miles of stream the organization already has worked to restore.

But, she pointed out, "No one group can do this on their own."

Fred Johnson, reclamation manager for Amerikohl, said the man-made drainage trench will be filled in as part of the wetland construction.

Once preliminary studies and designs are completed, he indicated it should take about a month for the company to construct the wetland system using three Caterpillar vehicles: an excavator, a track loader and a bulldozer designed to work in mud.

Johnson noted the AWARE project will be the 24th mining reclamation or restoration effort Amerikohl has worked on in the Pennsylvania, Ohio, West Virginian and Maryland region.

According to Johnson, the wetlands site sits on several hundred acres of property and coal reserves Amerikohl owns near Aultman.

It's part of more than 4,000 acres of reserves the company purchased from the former holdings of Rochester & Pittsburgh Coal.

In a separate project, Johnson said, Amerikohl has agreed--in conjunction with its surface mining plans for the property--to dispose of a bony pile of waste coal which rises above the highway across from the planned wetland site.

"We've been waiting for that for 50 years," Calvetti said of the unsightly pile.

Brian Okey, who is the president of AWARE and a professor in IUP's geography and regional planning department, indicated the wetland project is "a big step for AWARE and for the community."

In the group's three-year history, he noted, "We've received well over $60,000 in funding." An initial grant from the League of Women Voters helped the group to create a brochure to publicize its goals and to recruit members.

According to Okey, the Aultman wetland site is "kind of a preliminary project. There are other (mine drainage) sources we'll look into as well."

A watershed assessment report has just been completed to provide AWARE guidance for potential future projects.

Among projects indicated as high priorities are:

nPlanning treatment options for at least five other known acid mine drainage sites;

nAddressing discharge of sediment into the Conemaugh River Lake from Aultman Run while studying erosion from other tributaries to the lake;

nContinuing water quality monitoring throughout the watershed--particularly on Reeds Run, a tributary to Aultman Run;

nEncouraging townships to tap state funding to maintain unpaved roads and control release of sediment--especially on Hunter Road and Klimko Road, which are respectively near Aultman Run and the tributary Neal Run;

nEnlisting community volunteers and students to complete a vegetation inventory, aquatic survey and fisheries evaluation of important biological areas in the watershed;

nTaking part in developing habitat improvements as part of a joint federal and state wetland project on the Conemaugh Lake;

nImplementing fish habitat enhancement projects and assisting the state Game Commission and the U.S. Army Corps of Engineers with maintenance of a planned boat launch on the Conemaugh Lake;

nEncouraging formation of environmental advisory councils for local municipal governments;

nIncorporating into a single database all water quality samples collected by AWARE and other groups.

Okey noted AWARE also has organized volunteers to pick up litter along sections of the watershed.

In the most recent effort, he recalled, about 70 abandoned tires were removed in just one area.

The group's third such clean-up effort is set for April 12.

The Aultman Run Watershed encompasses 28 square miles in Center, Armstrong, Blacklick, Young and Conemaugh townships.

AWARE's nine-member board is elected annually and meets on the third Monday of each month at 7 p.m. in the Aultman fire hall.

Jeff Himler can be reached at jhimler@tribweb.com or (724) 459-6100, ext. 13.

Indiana surveyor William Altimus and AWARE members Don Burkett and Bill Frain look at a aerial survey map of the project site.